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CATALOGUE

OF

CASTS OF FOSSILS,

FROM THE

PRINCIPAL MUSEUMS OF EUROPE AND AMERICA,

WITH SHORT DESCRIPTIONS AND ILLUSTRATIONS,

BY

HENRY A. WARD, A.M., F.G.S.,

Professor of the Natural Sciences, in the University of Rochester.

ROCHESTER, N. Y:
BENTON & ANDREWS, PRINTERS.
1866.

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"Geology, although it cannot prove that other planets are filled with appropriate races of living beings, has demonstrated the truth of conclusions scarcely less wonderful:—the existence on our own planet of so many habitable surfaces or worlds as they have been called, each distinct in time, and peopled with its peculiar races of aquatic and terrestrial beings."

SIR CHARLES LYELL.

SMITHSONIAN LIBRARY

INTRODUCTION.

No science has advanced with more rapid steps than Geology; nor is any other science daily attracting such an increasing share of attention from all classes of society. Its popularity is due to its wonderful revelations and its practical bearing on the felt wants of the people. The history of the past would be unknown but for the unlooked-for discoveries which Geology has lately achieved, while the advantages arising from a correct knowledge of the internal structure of our earth are so apparent that no one dares to question its utility.

A science so profoundly practical and so intensely interesting,—rewarding research with its sublimest truths,—will never lack students. And it becomes a matter of no secondary importance to provide for their approaching the subject through the proper avenue. The peculiar nature of the study, as well as the high place which it is taking in our Institutions of learning, demands for it better and increased appliances for illustration. For it is clear that in Geology, not less than the other Natural Sciences, something more is needed than simple text-books or oral teaching. Visible, tangible objects can alone meet this necessity, and give the student clear and correct views. "I have satisfied myself long ago, (says Agassiz,) that the grand and most elementary principles of our science are better understood when illustrated from nature than when explained in a more abstract maner. In this way, each student is as it were, led to go himself over the road through which science itself has passed in its onward progress; and, far from protracting his course, he soon finds that he is brought without preamble into the very sanctuary of science."

Museums of natural objects are becoming more and more a recognized necessity. Geological cabinets are multiplying in numbers and increasing in size. In them the department of Palæontology is securing a prominent position, now that Geologists more fully appreciate the real value of fossil organisms, and regard them as

portions of the great life-history of our globe—essential links in the chain of Zoological series—instead of mere "medals" for the identification of strata. Some of the greatest questions as to the past condition of the earth are to be answered only by the study of fossil in connection with living forms.

But a Palæontological cabinet, in order to serve its end, must possess a certain completeness. To illustrate certain forms of primeval life in undue proportion, accumulating species under some few genera and leaving whole families, orders, and even classes of the fossil Zoological series entirely unrepresented, is to distort nature. This sort of exclusiveness is an unavoidable feature in the drawers of a Palæontologist who is working on a special fauna or some particular zoological division of fossils. But to accomplish the purposes of general instruction, a cabinet of fossils should be as complete as possible, covering the whole ground, and giving an unbroken view of ancient life. What our Colleges must have as the primary condition of their success in the Natural Sciences,—and yet that which, it must be said, they almost universally lack,—is a consistent and well-proportioned exhibition of all the classes in the several departments of nature.

There are many difficulties in the way of attaining this completeness in a Museum of Palæontology. One of these arises from the fact that such collections are usually the fruit of explorations in a limited area, and show only the forms belonging to a single geological period and a single zoological province. Such a collection is of *great* value if earnestly and thoroughly studied in connection with the strata which furnished it, but it is utterly insufficient to give a correct idea of the broad features of ancient animal life at various times and over the entire globe. The Corals, Crinoids, Brachiopods and Trilobites, which unduly preponderate in cabinets made in the Palæozoic areas of our Northern, Middle and Western States, should be rounded out and symmetrized by suitable additions of higher and different forms from the Mesozoic and Tertiary rocks of other parts of the world.

With methodic, intelligent effort, and a judicious expenditure of funds, this difficulty may be met and the desired variety obtained. But our Museum still has a defect which it is impossible to overcome other than in one way. Unless the funds to invest have been princely, and the facilities for securing choice material very great and extended over a long period of years, we shall find that our specimens show but trivial portions of the larger and, in some sense, more interesting and important forms. Our Mastodon and Mammoth will

be represented by—a tooth, a vertebra, or perchance a portion of a femur or a humerus. Similar fragments will represent our collections of Pachyderms, Ruminants and Cetaceans. Of Birds we shall have *nothing*; of the great Land-Saurians *nothing*. The 40 or 50 genera and more than 100 species of Marine Lizards will be represented by the paddle, or quite possibly by the entire skeleton of a *young* Ichthyosaurus. While among Fishes, we shall have several scores of specimens, of which only half a dozen will be perfect. A similiar incompleteness, though to a somewhat less extent, will appear among many divisions of the Invertebrates. In a word, we may be able to show *labels* for a very full series of Fossils throughout the entire Zoological series, but the specimens themselves give the student a very faint idea of the animals for which they stand. Once more; there will be no representation whatever of scores of the most interesting forms which Geology has ever revealed. We have none of the Quadrumana; none of the great Carnivores—such as Machairodus and Hyænodon; none of the Rodents; no Megatherium, Glyptodon, or other Edentates; no Sivatherium, Dinotherium, Palæotherium, Rhinoceros, Hippopotamus, Tapir or Toxodon; not even any perfect skulls with which to convey some exact idea of our own great Mastodons and Mammoths; no Marsupials, Cetaceans or Birds, no Iguanodon, Megalosaurus, Labyrinthodon, Mosasaurus, Pliosaurus, Pterodactyle, and many more gigantic Reptiles whose names are familiar to us all, but of which. for the very reason we are noting, the majority of our students and not a few teachers (not professionally men of science,) are strangers to any accurate idea. The same thing will be true in many important forms of Invertebrates,—although the greatest difficulty in this division will be that the state of the individual specimens secured will be such that they represent the genus or the species far more often than they will show the particular points by which these are characterized. A series of type-specimens of Ammonites, Crinoids, and Trilobites might be purchased, perhaps, for $50.00,—at least the labels would show most important generic names,—but $1.000. and a vast deal of labor would be a low price for perfect specimens of these same forms.

The author of these pages has had considerable experience of the difficulties above mentioned, in his efforts during the last six years to give completeness to the Palæontological Cabinet of the University of Rochester. He has found that the only possible way to give this collection its desired symmetry was by the introduction, in the classification, of *Plaster Copies* of very many of these fossils, the originals of which are either unique specimens or are so very rare that it is

altogether impossible to obtain them. The series of extinct forms can by this plan be made substantially complete, and the Cabinet enriched by many specimens of great scientific value, and of great attractiveness to the general visitor The author has obtained these casts by the slow labor of years, seeking the copy of the best original wherever it was to be found. Many of the rarer and most noted specimens are from the British Museum, and the Garden of Plants at Paris. Others are from Royal Museums in Berlin, Vienna, Copenhagen, St. Petersburg, Munich, Turin, Lyons, Darmstadt, Haarlem, &c. In America he has received generous assistance in the privilege of copying specimens from the Academy of Natural Sciences, at Philadelphia, the Boston Society of Natural History, the Museum of Comparative Zoology at Cambridge, and from Professor T. R. Pynchon of Trinity College, Hartford, Conn. But by far the most important additions from American sources are copies of the most striking *Ichnites*—or fossil tracks—from the celebrated Ichnological Museum of Amherst College; and also a series of nearly 200 specimens (mainly of Trilobites and Crinoids) chosen throughout the unrivalled collection of American Palæozoic fossils of Professor James Hall, of Albany. The Ward Museum of the University of Rochester has also supplied originals of some choice and rare fossils in the Vertebrate division, and very many of the finest Invertebrate specimens, particularly among the Cephalopod Molluscs, the Crinoids, and the Sponges.

These casts are now—for the first time—offered to the Educational and Scientific Institutions of our Country, with the hope that their advantages in the illustration of the Science of Geology will be appreciated and be real.

Those who examine the Catalogue here given, or glance at the Summary at its close, will see that the Zoological Series is very complete through nearly all its Classes and Orders, while the great Periods of Geological time are each well represented.

Especial attention is, however, called to a few of the more prominent and interesting objects.

Among MAMMALS,

the Human skeleton from Guadaloupe is of peculiar and unique interest, and never before copied.

The series of Ruminants and Palchyderms from the Sewalik Hills —outliers of the Himmalaya—form a strange group, the history of which has been most dilligently aud ably worked out by Messrs. Falconer and Cautley in the publications of the Asiatic Society of Bengal.

Many of these originals were formerly the property of the East India Company, but are now in the British Museum. In the same Museum are the huge, uncouth fossil Edentates from the Pampas of South America,—the Megatherium, Scelidotherium, and Glyptodon,—which, like the Marsupial Diprotodon and Nototherium,—now copied for the first time,—furnished Owen the materials for some of his most masterly Monographs. The Palæotherium, Anoplotherium, Anthracotherium, and other forms from the Gypsum beds of Montmartre, Paris, are of peculiar interest as being the identical specimens from which the great Cuvier first told Science of animals which once lived and are now extinct. The Miocene Tertiary of Central France, and of the still more northerly Rhine Valley, has yielded many specimens of Rhinoceros, Tapir, Hippopotamus, &c.,—genera now confined within the tropics. Finally the Colossal Mammoth and Mastodon have their anatomy well represented by a large series of bones from all parts of their skeleton from many localities in Asia, Europe and America. The Mammals are represented by over 100 species, some of them the largest fossils which have ever been cast.

The class of BIRDS,
is illustrated by portions of some gigantic individuals from New Zealand and Madagascar, while the "Ornithichnites"—copied from the finest slabs in the splendid series collected by the late Dr. Hitchcock for the Museum of Amherst College,—are most effective transcripts of the strange originals.

Among REPTILES,
the Lias of Lyme Regis, England, and of Boll, Wirtemberg, and the Oolite of Solenhofen, Bavaria, have furnished many celebrated forms among the Marine Saurians, Crocodileans, and Pterosaurians, while the Great Tortoise—over 8 feet long!— smaller Turtles from the "Bad Lands" of Nebraska, and the skulls and tracks of the Cheirotherium or Labyrinthodon—the great Trias Batrachian of England and Saxony —complete this class.

The series of FISHES,
from the Old Red Sandstone of Scotland, the Lithographic Limestone of Solenhofen, the Chalk of England and the Tertiary of Monte Bolca and of Œningen, contains many finely preserved and interesting specimens.

Among the ARTICULATES,
there are quite a variety of Crabs and Lobsters of Mesozoic and Tertiary age which constitute a valuable complement to our American crustacean forms. They are accompanied by a fine suite of Trilobites, containing over 80 specimens, which are in part from Bohemia, Sweden,

and England, and in part American species from Prof. Hall's rich collection.

Among the MOLLUSCS,
the Cephalopoda attract especial attention. The Dibranchiates are shown by some interesting Belemnites and Teuthidians, while the Ammonites,—mainly from the Ward Museum of the University of Rochester, and from the author's private Cabinet,—illustrate the "types" of Von Buch and D'Orbigny, adding also many large and rare forms; and are without question the most perfect series of these shells which has ever been copied. There are also many interesting specimens of the Nautilidæ and Orthoceratidæ from America and Europe, and the Hippuritidæ and Mesozoic Brachiopoda from France, and Palæozoic Brachiopoda from England and America, are worthy of especial notice.

Among the RADIATES,
are 105 Echinoidea, most of which are chosen from a series issued many years ago by Prof. Agassiz at the time of his important publications on this order. Also, a very rich series of Crinoidea,—some of the larger ones from European localities, but in the main Palæozoic species from localities in New York and the Western States, and furnished by the Cabinet of Prof. Hall.

Finally, the PROTOZOA,
are represented by a series of 200 Foramenifera which—enlarged 50–75 diameters—illustrate beautifully the strange, *bizarre* forms of these minute animalisms. The division closes with a suite of Sponges, mainly of Cretaceous age, from European localities, the originals of which are in the Ward Museum of the University of Rochester.

Many minor divisions are omitted in this short *resumè*. It is sufficient to say that the whole number of *twelve hundred specimens*, which are given in this assemblage, have been chosen for their individual, scientific value. Some specimens have a traditional interest, as connected with the growth of Geological Science. Others—like the Megatherium and Iguanodon—are fossils of general celebrity. Others are chosen and made up into suites, to illustrate by chosen forms the natural sections in various Zoological groups.

The student of Geology will find here a very large proportion of those genera and species which mark the several divisions of Geological time, and which are cited and figured in his text-books as "characteristic fossils"; while the investigator of fossil Zoology will also have possession of many scores of extinct forms which will complete his cabinet-series.

These casts of fossils have the great advantage that they are in almost every case copies of the most perfect specimen of the object which has ever been found. This specimen, too, is often a *unique* one, the cast is the only representation of the form which can ever be ranged in the classification of a Cabinet, and yet no Cabinet can be complete in its series without it.

Few of them are *restored* in any way, and when this is the case it is indicated.

These casts are intended to be exact copies in form and detail of surface, of the originals, and such care is taken in their coloring that large numbers of them will hardly be detected, *as casts*, when ranged with original specimens on the Cabinet shelves.* Much care has been taken in coloring them, and in perfecting processes for making them light and strong, so that they can—all save the very largest—be taken to the lecture-room for class purposes.

The casts are adapted by their size and form for various positions in a collection.

Most of them are suitable for the shelves of a Museum, a few are large slabs, and intended for a place upon the walls, while a small minority are huge objects calculated to stand on pedestals in the central parts of the room. The whole thus form very ornamental objects for a large Geological Hall. A handsome printed label accompanies each specimen; giving in full the name of the fossil, the author of the species, its geological formation, the locality where it was found, and—in the case of the Vertebrates—the museums in which the original specimen is now deposited. A number on the label accords with the number under which the specimen is described in this catalogue.

These casts are given on the express condition that the individual or Institution which purchases them will not copy them, nor allow them to be copied. The large sum of money which the writer has invested in the original procuring of these specimens makes such a restriction, for the present at least, an imperative one.

HENRY A. WARD.

University of Rochester, Sept. 1, 1866.

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* "A fossil bone and a colored plaster-cast of it are not distinguishable at first sight, scarcely by sight at all. The artificial junction of a series of casts of the bones of an unique fossil skeleton, produces a result equivalent, for all the purposes of public exhibition, to the articulated skeleton itself. Thus every capital in Europe, the Public Museum of each civilized community, may show to the people the proportion of the creatures of former worlds that science has so restored. Requisite space for exhibition being provided, reciprocal interchange of casts would soon furnish such museums with the co-adjusted frame-works of the most remarkable extinct animals that have hitherto been reconstructed."

OWEN on a National Museum of Natural History, page 69.

NOTICE.

The Classification given in the following pages has been chosen as a convenient manner of throwing the specimens, with their descriptions, together. The large divisions of Cuvier have thus—in the main—been adopted as being more widely known,(although many of them are behind the present state of the Science) while the filling in of genera and species has usually been put, for convenience, in alphabetical form. The Wood-cuts are, some of them, of very mediocre execution, they being intended as simple illustration of a price-list rather than for study, and thus being, for the sake of economy, *transfers* of figures found in various books.

For more full information, and for convenience in estimating the space which they will occupy, the *two greatest diameters* of each specimen are given, except in the cases where these diameters are less than six inches.

The prices of these casts have been put as low as the present cost of their manufacture will allow.

Ten per cent. (the simple cost of material employed) should be added to the prices given, for *packing*. When the order is for an amount of $200.00, or over, the packing will not be charged for.

Payment should in all cases accompany the order.

Advice will, when desired, be given to those who wish to purchase for a given amount, as to what individual objects in the list best illustrate the kinds which they would obtain.

H. A. WARD,
Rochester, N. Y.
P. O. Box 1125.

FIRST SUB-KINGDOM.

VERTEBRATA.

The four great Classes of Cuvier, comprising this Province of the Animal Kingdom, have in common a general type of structure, clearly recognizable in all the members of the series. The grand characteristic is an interior jointed skeleton, made up of vertebræ, which with their processes form two cavities — the upper enclosing the great nervous cord, the lower containing the viscera.

The history of Mammals, Birds, Reptiles and Fishes, *as a sub-kingdom*, reaches back to the Upper Silurian Period. Their fossil bones and teeth, usually in a fragmentary state, have been found in every stage of alteration, from their present gelatinous state to that of complete petrifaction, and demonstrate the existence of numerous tribes of highly organized beings in the primeval age of the world, and the continuance of the same type of organization to the present day. The earliest evidence of a vertebrate animal, is of the cold-blooded, water-breathing class. The vertebrate type, however, did not start from the inferior Fishes, but from the higher forms — the Ganoids and Selachians; the species now swarming in river, lake and ocean, did not come into existence until the Cretaceous Period. Reptiles were introduced in the Carboniferous — first Amphibious, then the typical forms. In the Reptilian Age come the first of Birds, and the first of Marsupials. The true Birds and Mammals had their full expansion in the Tertiary.

CLASS I. — MAMMALIA.

The fossil relics of the Mammalia Class consist, for the most part, of single and displaced bones, or groups of bones and teeth, and the durable portions of the dermal integument. It is for this reason that Cuvier long ago remarked, that the determination of the remains of Quadrupeds is beset with more difficulties than that of other fossils. For while shells are often found unbroken, and the skeletons or scaly coverings of Fishes occur more or less entire, the complete skeleton of a fossil Mammal is exceedingly rare.

The earliest trace of a warm-blooded, air-breathing, viviparous animal, appears in the Upper Triassic — the *Microlestes*, a very small Insectivore, and probably a Marsupial, having been discovered in a bone-breccia at Diegerloch, Wirtemberg. Evidences of several quadrupeds have been observed in strata of nearly the same antiquity, such as the tooth of the *Dromatherium*, from North Carolina; of the *Amphitherium*, *Amphilestes*, *Phascolotherium*, and *Stereognathus*, from the Stonesfield Slates; and of the *Spalacotherium*, *Triconodon*, *and Plagiaulax*, from the Lower Purbeck beds. Cetacean remains occur in the Greensand of New Jersey and England. A lapse of time incalculably vast, represented by the Wealden and Cretaceous Periods, intervened between the terrestrial Mammals just mentioned and the *Coryphodon* and *Palæocyon* — the first examples of Mammalian life in the Tertiary. From the Eocene to the present day, an extensive and varied Mammalian fauna has existed, and left remains in the beds of ancient estuaries, lakes and rivers, in peat bogs, marl pits, and especially caves, which served as lairs for predaceous species, and as charnel-houses to their prey. Under the hand of Cuvier the Eocene specimens became the opening chapter to the great volume of Palæontological Science.

Order 1 — Bimana.

This Order, which justly stands at the head of animated Nature, includes only one genus—*Homo*,—and but one well determined species —*sapiens*, or Man. He is the only animal truly bimanous and biped; and he is the only living Mammal having no vacant space in the dental series of the jaw. In him the vertebrate type, which began during the Palæozoic age in the horizontal Fish, finally becomes erect.

The Palæontological history of Man, before it passes over to Archæology, is very brief. His creation must have been extremely modern, for his skeleton, more likely to become imbedded in lacustrine or submarine deposits than that of any other terrestrial Vertebrate, is found only,

and that rarely, in the most recent formations, in which nearly all the other fossil forms are referable to living species. The evidence that man existed in the early fluviatile Drift Period, is derived solely from ossiferous caverns. Human implements, however, have been discovered in disturbed Alluvium, associated with the remains of extinct Post-Glacial Mammals.

No. 1. Homo.

SKULL, discovered in 1857, in a limestone cave in the Neanderthal, near Düsseldorf. The cranium (the part preserved, including the frontal bone, both parietals, part of the temporal, and the upper third of the occipital) is of unusual size and thickness, the forehead narrow and very low, and the projection of the superorbital ridges enormously great. In capacity it ranks very nearly on a level with the mean of the two human extremes, and very far above the pithecoid maximum. Still, it is the most ape-like of all human skulls, the brain-case being flattened to a degree unknown before. The conclusions of Prof. Huxley are: First, that the extraordinary form of the skull is due to a natural conformation, hitherto not known to exist even in the most barbarous races. Secondly, that it belongs to a period antecedent to the time of the Celts in Germany, and was in all probability derived from one of the wild races of Northwestern Europe. And, Thirdly, that it is beyond doubt traceable to a period at which the diluvium still existed. The original, now in possession of Dr. Fuhlrott, of Elberfield, has lost much of its animal matter, and is covered with dendrites. [*See Lyell's Antiquity of Man.*]

Size 8 x 6. Price, $1.50.

No. 2. Homo.

SKULL, discovered in 1834 in the Engis cavern, near Liége, on the left bank of the Meuse. It exhibits the frontal, parietal and occipital regions, as far as the middle of the foramen, and a part of the right temporal bone. It was found associated with the bones of extinct animals, yet approaches very near to the Caucasian type; while the Neanderthal skull, though having no such decided claims to antiquity, departs widely from the normal standard of the human race — the cerebral development falling as much below that of the Australian as that of the Engis exceeds it. The original is now in the Museum of the University of Liége. Size, 8 x 5. Price, $1.75.

No. 3. Homo.

LOWER JAW, from the Cave at Arcy, Department of the Yonne, France. The original is in the Cabinet of the Marquis de Vibraye, Paris. Price, $0.60.

No. 4. **Homo.**

SKELETON, found on the north-eastern coast of the main-land of Guadaloupe, in a bed of modern concretionary limestone. The rock contains the detritus of shells and corals of species now inhabiting the neighboring sea (some of the coral still retaining the same red color now seen in reefs of living coral which surround the island), land-shells, fragments of pottery, stone arrow-heads, carved wooden ornaments, and detached human bones. The parts preserved in this specimen are the spinal column, many of the ribs, the left arm, pelvis, thighs and legs. These bones still contain some animal matter, and the whole of their phosphate of lime. The original is in the British Museum; the skull is in the Medical College of Charleston, S. C.

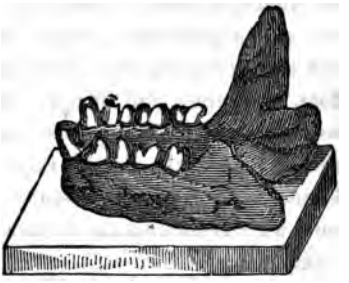
Size, 4ft. 7 in. x 2ft. Price, $20.00.

ORDER 2 — QUADRUMANA.

These Mammals, the most anthropoid of Brutes, are characterized by prehensile feet as well as hands. In all the genera above the Lemurs of Madagascar, the same number and kinds of teeth are present as in Man — the deviation being the disproportionate size of the canines and the concomitant break in the dental series. The skull of the Great Apes is distinguished by a prominent superorbital ridge.

Cuvier held that the Quadrumana were scarcely, if at all, anterior to Mani n order of creation. Lyell was the first (1830) to express a doubt of the total absence of fossil anthropomorphous tribes. In 1839 fragments of the lower jaw of a Monkey (*Eopithecus*) were discovered by Owen in the London Clay, on the banks of the Deben, Eng. Since then, remains have been found in the Sewalik Hills, India; in the Miocene strata of Southern France and of Greece, and in the Pliocene of France and Brazil. None of the Lemuridæ have been discovered fossil.

No. 5. **Dryopithecus Fontani,** Lartet.



LOWER JAW, with pedestal. Of this extinct Monkey, Sir Charles Lyell states "that in anatomical structure, as well as in stature, the D. came nearer to man than any quadrumanous species, living or fossil, before known to zoölogists." Prof. Owen, however, arrives at a different conclusion; and the generally received opinion is, that the D. stood intermediate between the Gibbon and Semnopithecus. It was therefore far removed from the human type, for the Quadrumana recede from man in the following order, making cranial character the test: Gorilla, Chimpanzee, Orang, Gibbon. The canines are less developed than in the Gorilla, and in this respect the D. makes a nearer approach to Man. The fore part of the coronoid process is slightly convex, as in the Gibbon; in Man, the Gorilla and Chimpanzee, it is concave. This interesting fossil was discovered by M. Fontan, in 1856, in the fresh water (upper) Miocene at Saint Gaudens, Southern France, and is preserved in the Museum of the Garden of Plants, Paris. Price, $2.25.

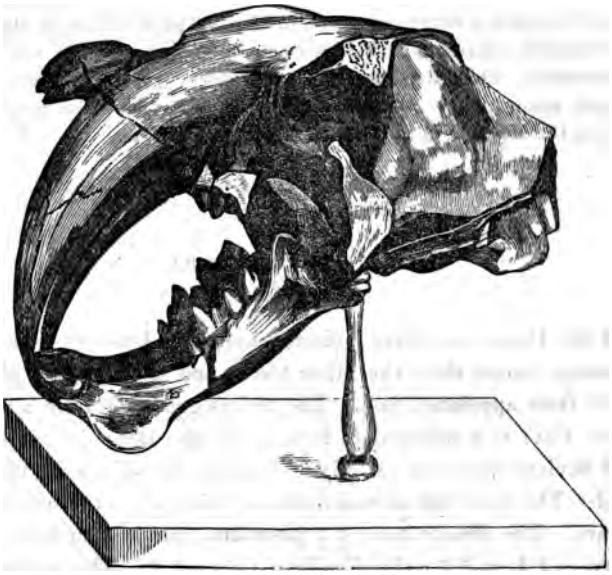
ORDER 3 — CARNIVORA.

All the Carnivores have incisors, canines and molars — the canines being always longer than the other teeth, and showing at a glance the nature of their appointed food. The molars graduate from a trenchant (as in the Cat) to a tuberculate form (as in the Bear) in proportion as the food deviates from one strictly of flesh to one of a more miscellaneous kind. The more the animal feeds on living prey, the less numerous the molars. The *Felidæ* have $\frac{3}{3}$ $\frac{3}{3}$ premolars, and $\frac{1}{1}$ $\frac{1}{1}$ molars; the *Canidæ* have p $\frac{4}{4}$ $\frac{4}{4}$, m $\frac{2}{2}$ $\frac{2}{2}$; the *Ursidæ* p $\frac{4}{4}$ $\frac{4}{4}$, m $\frac{2}{3}$ $\frac{2}{3}$. The molars of the *Insectivores* are studded with conical points; those of fruit-eating Bats have flattened crowns. Clavicles are generally rudimentary or wanting; but *Bats* and *Insectivores* have them well developed, as also broad scapulæ and keeled sternums, the former for flight, the latter for digging in the soil.

The fossil bones of Carnivores are found principally in caves and fissures. The Digitigrades first appeared in the Eocene age, — the *Palæocyon* from the Plastic Clay of England and France being one of the first of the whole order. A forerunner of the Plantigrades appeared in the Upper Eocene in the *Amphicyon;* but the Plantigrades proper did not exist prior to the Miocene Period. The amphibious Carnivores (*Seals*) have not been found below the Miocene. The earliest represen-

tative of the *Insectivores*, so far as known, is a Hedgehog discovered in the Auvergne beds, between the Eocene and Miocene in age. The caverns and Pleistocene strata of England afford numerous remains; but, with one exception, they offer no specific difference from the common Mole, Hedgehog, and Shrew. None of the frugivorous *Bats* have been observed fossil. The species that have left remains in the ancient deposits belong to the family *Vespertilionidæ*, which first appeared in the Eocene. According to Owen, "no remains of *Bats* have hitherto been found which establish the former existence of any species not now known to exist."

No. 6. **Machairodus neogæus**, Kaup.



HEAD, mounted. This, happily extinct and most formidable of Carnivores, belonged to a genus which in Tertiary times ranged throughout South America, India and Europe. Professor Owen finds its nearest affinities in the Lion. It equalled the Bengal Tiger in size, and had upper canines of thrice the length—the crown alone measuring 7 inches. The canines of the M. are, in fact, the most remarkable of all the fossil teeth of large carnivorous Mammals that have been discovered; they are long, curved, and compressed, and, provided with a double-cutting edge of serrated enamel, resemble trenchant sabres, whence the generic name. There is a depression on the outside of each ramus of the lower jaw to receive the upper canines when the mouth is closed. Both sets of teeth are finely preserved in the specimen. The specimen is identical with *Hyæna neogæa* of Lund, and *Felis smilodon* of Blainville. The original, discovered in a bone cavern in Brazil, is in the Museum of the Garden of Plants, Paris.

Size, 14x13. Price, $12.00.

No. 7. **Felis cristata,** Falconer and Cautley.

SKULL. This Feline was near neighbor to the Tiger, but differed chiefly in having a more prominent occipital crest. The original specimen was discovered by Falconer and Cautley in 1835, in the Sewalik Hills, India (Miocene), and is preserved in the British Museum. Size, 10 x 13. Price, $2.00.

No. 8. **Felis leptorhina,** Bravard.

SKULL AND LOWER JAW. This species is distinguished by its elongated muzzle. The fossil was found in the Miocene of Auvergne, Central France, and is now in the Museum of the Garden of Plants. Size, 6 x 4. Price, $2.50.

No. 9. **Felis palæotigris,** Falc. and Caut.

SKULL. The original, discovered in the Sewalik Hills, India (Miocene), is in the British Museum. Size, 11 x 6. Price, $1.75.

No. 10. **Hyænarctos Sivalensis,** Owen.

SKULL. This genus, of which but a single species is known, was founded by Owen upon specimens found by Messrs. Falconer & Cautley in the Sewalik Hills, India. It has features in its dentition which give it an intermediate position between the Hyena and the Bear. The original is in the British Museum.
Size, 8 x 4. Price, $1.50.

No. 11. **Hyæna eximia,** Wagner.

LOWER JAW, LEFT RAMUS. This fragment, found in a Pleistocene formation at Pikermi, Greece, shows two incisors, two molars, and a canine. The original is in the University Museum, Munich.

Size, 6 x 2. Price, $1.25.

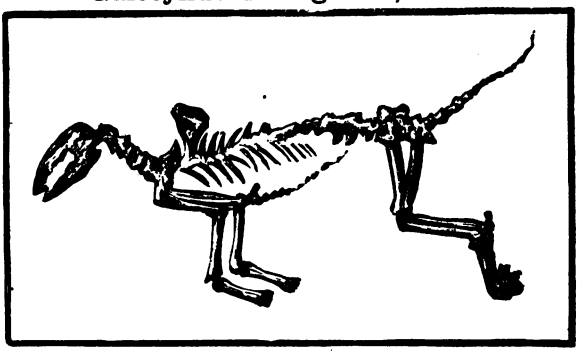
No. 12. **Hyænodon brachyrhynchus,** Blainville.

HEAD. This Carnivore, which, judging by the character of its carnassial teeth, must have been more ferocious than modern wolves or tigers, is distinguished by a large facial area, a very marked sagittal crest, and an extreme prolongation backward of the palatal bones. Each jaw has six small incisors, two large prehensile canines, four compressed, pointed premolars, and three molars. It was discovered in a Lower Miocene marl on the banks of the Tarn, near Robasteins, Southern France, and is preserved in the Museum of Toulouse.
Size, 7 x 4. Price, $2.25.

No. 13. **Dinocyon Thenardi.**

LOWER JAW, RIGHT RAMUS. The original, discovered in 1861, in the Lower Miocene near St. Alban, department of Isere, Southern France, is preserved in the Museum of Natural History at Lyons, France. Size, 6 x 4. Price, $1.50.

No. 14. **Galecynus Œningensis,** Owen.



SKELETON. This interesting and well preserved fossil rewarded the early geological pursuits (1828) of the distinguished author of the "Silurian System." The novel occurrence of an entire carnivorous quadruped regularly imbedded in stone, as well as some peculiarities in its anatomy, makes this a singularly unique specimen. VonMeyer first proposed the name of *Canis palustris*, and M. de Blainville called it *Vulpes Œningensis;* but after careful examination Professor Owen gave it an intermediate position between the Polecat and Dog. The first premolar is smaller, and the third and fourth larger, than in the Fox, and all the teeth are more closely set than in the genus *Canis*, though the dental formula is the same. The general breadth of the feet, in proportion to their length, is greater than in any living canine species, and it is this robust character of the feet which indicates an affinity to the Viverrine group. The tail is longer in proportion than in the Dog, though not so long as in the Fox. The vertebræ number the same as those of the Fox. The fossil was discovered in a lacustrine schist (Older Pliocene) at Œningen, near Constance, and is now in the British Museum.

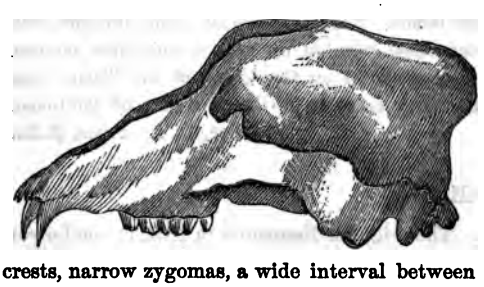
Size, 3 ft. x 2 ft. Price, $7.00.

No. 15. **Amphicyon major,** Lart.

UPPER JAW, RIGHT RAMUS. This large carnivore was a forerunner of the Plantigrade family, having the tuberculate molars of the Bear, but in every other respect retaining the dentition of the Dog. This species is identical with the *A. giganteus* of Laurillard. It had the general proportions of the Lion and the gait of the Bear. The fossil was found in the Miocene deposits at Sansans, Southern France, and is in the Mnseum of the Garden of Plants.

Size, 8 x 6. Price, $1.50.

No. 16. **Ursus spelæus,** Blumenbach.



SKULL. This "Great Cave Bear," as it is often called, according to Cuvier must have equalled a large Horse in size. It is distinguished by prominent frontal sinuses, a sudden sinking of the concave line leading forward to the nasal bones, long, high pointed crests, narrow zygomas, a wide interval between the formidable canine and the first molar, the complicated crown of the latter, and the great breadth of the

fourth molar. The little premolar situated just behind the canine in all living Bears except the Grisly, is always wanting; and the animal probably had but thirty teeth in all. The Brown Bear approaches nearest to the gigantic fossil in the peculiar serpentine line of the profile, and the Black Bear, in the cranial crests. This specimen was found in that great depository of osseous remains—the cave of Gailenreuth, Bavaria, and is preserved in the Museum of the Garden of Plants. Size, 20 x 13. Price, $6.50.

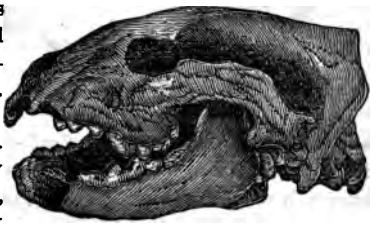
No. 17. **Ursus spelæus,** Blum.

PAIR OF MOLARS. Original in the Ward Museum, University of Rochester. Price, $0.30.

No. 18. **Ursus spelæus,** Blum.

CANINE. Original in the Ward Museum, University of Rochester. Price, $0.40.

No. 19. **Gulo spelæus,** Goldfuss.



SKULL AND LOWER JAW. The molars of this Glutton number five above and six below, and have cutting edges. The upper carnassial tooth has a very small talon, and only one tubercle. The zygomatic arch is slender and not very prominent. The original specimen was found by Soemmerring in the Cave of Gailenreuth, Bavaria, and is now in the University Museum at Bonn. Size, 6 x 4. Price, $2.00.

ORDER 4 — RODENTIA.

This Order contains the smallest of the Mammals, and the largest number of species. It is characterized by two long, incurved, rootless incisors in each jaw, enammelled only in front, and separated by a wide space from the molars. The molars have flat crowns with transverse enamelled ridges. The hind legs are generally much longer than the anterior pair; and excepting the Guinea Pig, Porcupine, Hare and Capybara, all have perfect clavicles. The skeleton is slight and feeble. The Beaver and Capybara are now the giants of the Order; but the *Muridæ* are the typical family.

No unequivocal evidence has yet been obtained of remains of Rodents in strata more ancient than the Eocene Tertiary. The fossils are chiefly found in lacustrine marls (Miocene), Pleistocene formations, and bone-caves.

No. 20. **Trogontherium Cuvieri,** Fisch.

LOWER JAW, RIGHT RAMUS. "This magnificent relic of the gigantic Beaver," as Owen calls it, was taken out of a lacustrine deposit of clay and reddish sand (Pliocene) at Ostend, on the coast of Norfolk, Eng. The chisel-crowned incisor measures seven inches on the outer curve, and is larger and stronger in proportion than in the existing Beaver; the outer enamelled part is more convex, and the inner surface is concave, while in the existing and fossil Beavers it is flat. The three anterior molars are also represented *in situ*. This fossil is preserved in the British Museum.

Size, 8x6. Price, $2.00.

No. 21. **Castoroides Ohioensis,** Foster.

SKULL AND LOWER JAW, RIGHT RAMUS. This species is the most gigantic member of the order of Rodents hitherto discovered, whether recent or fossil. It is akin to the Beaver, but differs chiefly in a less development of the cerebrum, in more prominent though more slender, zygomatic arches, and in its dentition. The incisors are fluted, and the molars (numbering four in each ramus) consist of a series of elongated elliptical plates of enamel which include the dentine. The plates are directed obliquely across the crown. The C. differs from all other Rodents in the size and conformation of the pterygoid processes and fossæ. All the processes and fossæ of the lower jaw are remarkably developed. The original specimen, supposed to belong to an animal nearly six feet in length, was found in 1841, in the Montezuma Marsh, near Clyde, N. Y., with shells of existing species, and is preserved in the Cabinet of Geneva College, N. Y.

Size, 10 x 7. Price, $4.00.

No. 22. **Castoroides Ohioensis,** Foster.

LOWER JAW, RIGHT RAMUS. Size, 8 x 4. Price, $1.50.

ORDER 5 — EDENTATA.

The Edentates include two genera (*Myrmecophaga* and *Manis*) which are devoid of teeth; the rest (with one rare exception) have molars simply, which have no true enamel, are never displaced by a second series, and are rarely implanted in the premaxillary bones. The Order is limited in the number of species (forming only $\frac{1}{54}$th of living Mam-

mals), but it is far from being so in the variety of its forms. In the Sloths, the Zygoma is straight and trigonal; in the Armadillo and Orycterope, twisted; in the Pangolin, thin, deep, and exteriorly concave; and in the Anteater, very small. South America is now, and has always been, the natural home of this Order.

Edentates began with the Miocene Period, and attained their maximum in the Pleistocene. Nearly all the fossil forms occur in the Pampean formation of South America. The only extinct Edentate found in Europe, and at the same time the most ancient, is the gigantic Pangolin—*Macrotherium*. The Monotreme and Anteater have not been discovered fossil, unless the *Myrmecophaga* of Dr. Lund be a true determination.

No. 23. **Megatherium Cuvieri,** Desmarest.

SKELETON. This gigantic fossil was first made known to the scientific world in 1789. It was discovered on the banks of the River Luxan, near the city of Buenos Ayres, and was subsequently transmitted to Madrid, where, for half a century, it excited the most lively speculations among all European naturalists, who were so fortunate as to see it. The original bones, of which this specimen is a copy, were found in the same Pampean deposit between the years 1831 and 1838, and belong partly to the Hunterian Museum of the Royal College of Surgeons, and partly to the British Museum. To give to the singular quadruped its proper position in the Animal Kingdom, was for many years a problem in comparative anatomy which the *savans* of Europe could not solve. Led astray by the huge carapace of the Glyptodon, found near it, the majority called it a mammoth Armadillo. CUVIER, who gave it its generic title, thought it combined the characters of the Sloth, Anteater and Armadillo. The merit of throwing a flood of light on the nature and structure of this most remarkable of all fossil mammals, was reserved for the celebrated English Geologist, Professor OWEN. He conclusively proves that the Megatherium was a "Ground Sloth," feeding on the foliage of trees which it unprooted by its great strength.

The extreme length of the mounted skeleton is seventeen feet and nine inches; its height, from the pedestal to the top of the spinous process of the first dorsal vertebra, is seven feet. No other fossil so exceeds its modern representative, as the lordly Megatherium surpasses the pigmy remnant of the Tardigrade race; for the largest living Sloth does not exceed two feet in length. One is tempted to join the Spanish naturalist who objected to the place assigned to the Megatherium, because "all the other Edentates could dance in his carcase." But that there is the closest affinity between it and the diminutive arboreal Sloth, is now undeniable. The number of the teeth, their deep insertion, equable breadth and thickness, deeply excavated base, inner structure and unlimited growth, and the absence of canines, are characters common to both. Both have the peculiar zygomatic arch to the skull; the alveoli of the jaws correspond in number, position and relative depth. There is the same anomalous shortness of face; a similar development of air cells surrounding the cerebral cavity; the like scapula, clavicle, ossified sternal ribs; the identically expanded ilia; the flattened femur;

and an equal number of sacral vertebræ. The part in which the Megatherium least resembles the Sloth, is the tail; and, as a general rule, in those modifications of structure in which it differs from its living analogue, it approximates to the Anteater; e. g. in the number and structure of the true vertebræ.

The astragalus is the most characteristic single bone in the skeleton; its upper surface being so hollowed on one side, with a wide crescentic groove, as to throw the whole weight of the leg upon the inner side of the foot. The anchylosis of the tibia and fibula is known among existing quadrupeds only in armor-bearing Edentates.

The head of the Megatherium is remarkable for its relatively small size, for the extraordinary depth of the lower jaw, and for the great size of the zygomatic processes. The length of the skull is thirty inches: three inches less than that of the Asiatic Elephant. The formation of the muzzle indicates the possession of a short proboscis. The dental formula is $\frac{5}{4}-\frac{5}{4} = 18$. The teeth are prismatic and slightly curved, and measure from eight to ten inches in length, and between two and three inches in breadth, In composition, a central axis of vascular dentine is inclosed by a wall of unvascular dentine, and this by one of cement.

The spinal column consists of seven cervical, sixteen dorsal, three lumbar, five sacral and eighteen caudal vertebræ, and measures fifteen feet in length, or three feet more than the Elephant's. The circumference of the skeleton, at the eighth rib, is eleven feet.

The Megatherium differs strikingly from existing quadrupeds of corresponding bulk, in the vast proportions of its anterior extremities. Its clavicle, fifteen inches long, is the longest known. The foreleg bespeaks enormous strength; with the foot, it is seven feet and four inches in length.

The posterior extremities are shorter than the anterior. The pelvis is the largest bone in any land animal, living or extinct; it is upwards of five feet broad. The rugged ilium and spinal crest show that it was the centre of muscular bundles of enormous power, which diverged to act upon the trunk, the tail and the hindlegs. These muscles, judging from the size of the spinal cord, which in this region is four inches in diameter, must have been characterized by the extreme energy of their vital contractibility. The acetabulum is excavated in a very exceptional manner, its concavity facing directly downward. This gave increased strength for sustaining vertical pressure at the expense of rapid motion.

The hindlegs appear more like columns for support than organs for locomotion, and, with the hindfeet, are models of massive organic masonry. The heel bone alone has the extraordinary length of seventeen inches, and a circumference of twenty-eight inches. The monster walked, like the Anteater, on the outside edge of its foot, on a marginal hoof-like callosity. The middle toe of the hind-foot, and likewise the second, third and fourth digits of the forefoot, were armed with powerful claws. The magnitude of the tail fills the observer with wonder: when clothed with flesh, it must have been more than six feet around at the greater end. With the hindlegs, it formed a tripod upon which the animal rested when obtaining its food.

It would be interesting to know something of the daily life of the animal whose colossal size was united to such strange anatomy. As the brain of the Megatherium was less by nearly one-half than that of the Elephant, we infer that he was a creature of fewer instincts. Nevertheless, his cotemporary quad-

[redacted]

rupeds must have acknowledged him as the head of the Animal Kingdom. To the tongue of a Giraffe and the proboscis of a Tapir, there was added the power of rotating the bones of the forearm. These prehensile organs were suited to a leaf-feeder. That the animal was not carnivorous, is settled by the structure of its molar teeth: it lacks incisors; therefore it was not a Ruminant. But if the great animal fed on foliage, how did it obtain it? The Elephant gathers its food with a long proboscis. The Giraffe, standing on stilt-like forelegs, and reaching out its attenuated neck, plucks the high branches with long flexible lips and muscular tongue. The Megatherium could imitate neither. Did it climb like the Sloth? Such was the conjecture of the Danish Naturalist, Dr. LUND; but the clumsy make and the immense bulk and weight of the creature forbid it. The structure of the forefeet, moreover, militates against the theory; for the outer digit is hoof-like, as if made for terrestrial progression. The hindlegs, too, are much shorter than the forelegs; and the tail is too short and thick for prehensible purposes.

The fossorial hypothesis, too, has no better foundation than the scansorial. In burrowing animals, as the Mole, the pelvis is remarkably slender, and the claws form a continuous plane with the palm of the foot; while in the Megatherium the pelvis is remarkably large, and not one of the claws can be brought into a line with the metacarpus. The fore-arms were plainly formed for grasping, not climbing or digging: they were instruments of tremendous strength, evidence of which is furnished by the deep grooves and sharp ridges on the radius and ulna, the starting points of stout tendons and muscles. The moment we estimate this force, the colossal proportions of the hind-extremities lose their anomaly and harmonize with the front. The application of the fore-arms to the work of tearing down a tree would demand a corresponding fulcrum, such as we find in the heavy pelvis, the ponderous tail and the massive hind-legs.

The Megatherium needed not agility for securing prey, for it was not carnivorous; nor for flight, for its size alone must have been a protection against any living foe. Had we beheld it living on its native plains, its slow movement would have excited our wonder as much as its bulk. It was doubtless a solitary animal. The gathering together in herds was not required for self-defence: indeed, the necessities of the creature to obtain an enormous daily supply of food would not have allowed it, unless the vegetation of that day were far more dense than is the modern vegetation of the same region. When stripping the trees it had prostrated, its position was probably a reclining one; and Professor AGASSIZ has ventured the opinion that this crouching attitude was constant to the animal, and that it crept along with the full length of its fore-arm resting upon the ground.

The Pampas, where the remains of the great fossil have been chiefly found, are vast plains, stretching from the mountains of Brazil to Tierra del Fuego. Palms grow at one end, while snow covers the other almost the entire year. The soil is chiefly a dull-reddish, slightly-indurated, argillaceous earth, with here and there calcareous concretions; underneath are beds of stratified gravel and conglomerate. These deposits constitute the Pampean formation, which varies in depth from twenty to one hundred feet. They were slowly formed at a time when the Atlantic reached far westward to the foot of the central mountain chain, down whose flanks the rivers brought the detritus and spread it beneath the waters in level layers at some distance from the shore. Carcases of animals floated down

upon the same streams, and, reaching the quiet waters, sank down in their muddy bed. The whole area has since been elevated; the estuary mud has been converted into wide and level plains, and the shores and submarine banks of a former sea now form low headlands along the present coast. It was in this recent formation—referable to the Pleistocene period, because most of its shells are still living in the ocean—that the Megatherium was entombed. Its bones are almost exclusively found in the cliffs and steep banks of rivers; thus far the Rivers Salado and Luxan. The race was not exterminated by some great cataclysm; for the small bones, like the kneecap, of a cotemporary mammal were discovered by Darwin in the same deposit, all lying in their proper relative position. Like the Aborigines of our own continent, like the Dodo of Mauritius, the Edentate giants perished one after another, in the lapse of infinite ages, by those changes of circumstances in the organic and inorganic world which are always in progress.

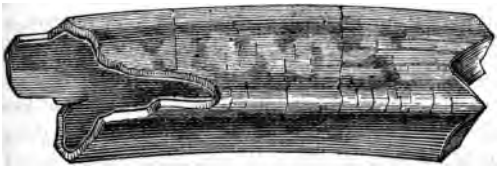
The Megatherium was buried in a hecatomb of extinct monsters. By its side we find the bones of the kindred Mylodon, Megalonyx and Scelidotherium, all of them Sloths; the Glyptodon and Schistopleurum, the Toxodon and Mastodon, the Machairodus and Macrauchenia. The Megatherium and its associates have been discovered in the Pleistocene deposits of the United States; but South America was then, as it is now, the metropolis of the Edentates.

This model consists of 124 different casts, representing more than 175 bones.*
Price, packed but not painted, $250.00.

No. 24. **Megatherium Cuvieri,** Desm.
SKULL AND LOWER JAW. Size, 32 x 24, Price, mounted, $15,00.

No. 25. **Megatherium Cuvieri,** Desm.
LOWER JAW. Size, 27 x 20. Price, $5.00.

No. 26. **Megatherium Cuvieri,** Desm.



TOOTH.
Size, 7 x 2. Price, $0.60.

No. 27. **Megatherium Cuvieri,** Desm.
RIGHT FORE-FOOT. Size, 16 x 13. Price, $5.00,

No. 28. **Megatherium Cuvieri,** Desm.
RIGHT HIND-FOOT. Size, 30 x 10. Price, $6.50.

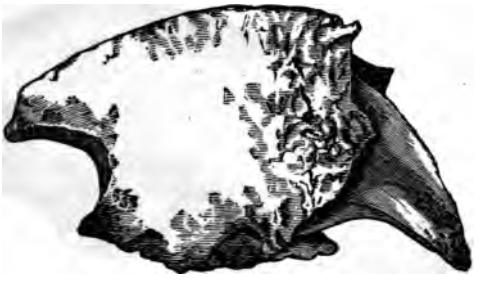
No. 29. **Megatherium Cuvieri,** Desm.
RIGHT HIND-FOOT WITH TIBIA. Size, 30 x 28, Price. $10.00.

No. 30. **Megatherium Cuvieri,** Desm.
RIGHT HIND-LEG WITH FOOT. Size, 4½ ft. x 2½ ft. Price, mounted, $25.

No. 31. **Megatherium Cuvieri,** Desm.
FEMUR. Size, 28 x 16. Price, $6.00.

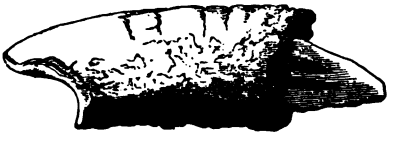
* For particulars about mounting the Megatherium, see Appendix A.

No. 32. **Megatherium Cuvieri,** Desm.



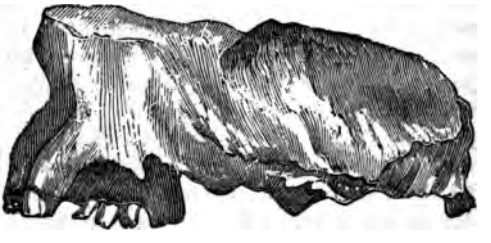
HIND-CLAW.—Size, 11 x 6. Price, $1.50.

No. 33. **Megatherium Cuvieri,** Desm.



FORE-CLAW.—Size, 9 x 4. Price, $1.00.

No. 34. **Megalonyx Jeffersonii,** Harlan.



SKULL. The remains of this huge terrestrial Sloth, so called from the great size of its claw, are found chiefly in the Upper Tertiary of Virginia, Tennessee, Kentucky, Mississippi, Alabama, and Texas. The genus was established by President JEFFERSON in a communication read to the American Philosophical Society, 1797, entitled "*A Memoir on the Discovery of certain Bones of a Quadruped of the clawed kind in the Western Parts of Virginia.*" The M. resembled the Megatherium in general form and habits, but was a third smaller. The fossil skull, of which this specimen is a cast, was discovered in a Pleistocene ferruginous sand and shell-bed near Henderson, Kentucky, and is now in the Cabinet of the late Professor D. D. OWEN, New Harmony, Indiana. It has lost its malar bones, the second molar on the left ramus, and the last on the right, but otherwise it is well preserved. The upper outline is nearly horizontal, and the cranium carries a prominent, rugged, sagittal crest. The zygomatic process projects outward and forward at an angle of about 45°. The face above is smooth and convex, and tapers forward. As in all the Sloth tribe, the teeth of the M. are long, fangless columns of uniform diameter, deeply excavated from the bottom for the reception of the dental pulp. The transverse diameter of the largest molar is one inch, and its length, five inches. The dental formula of the M. is $m.\ \frac{5}{4}-\frac{5}{4}=18$; the first molars being separated from the rest two inches. Characteristic of the family to which the M. belongs, the teeth are entirely destitute of enamel.—Size, 14 x 7. Price, $4.50.

No. 35. **Megalonyx Jeffersonii**, Harlan.

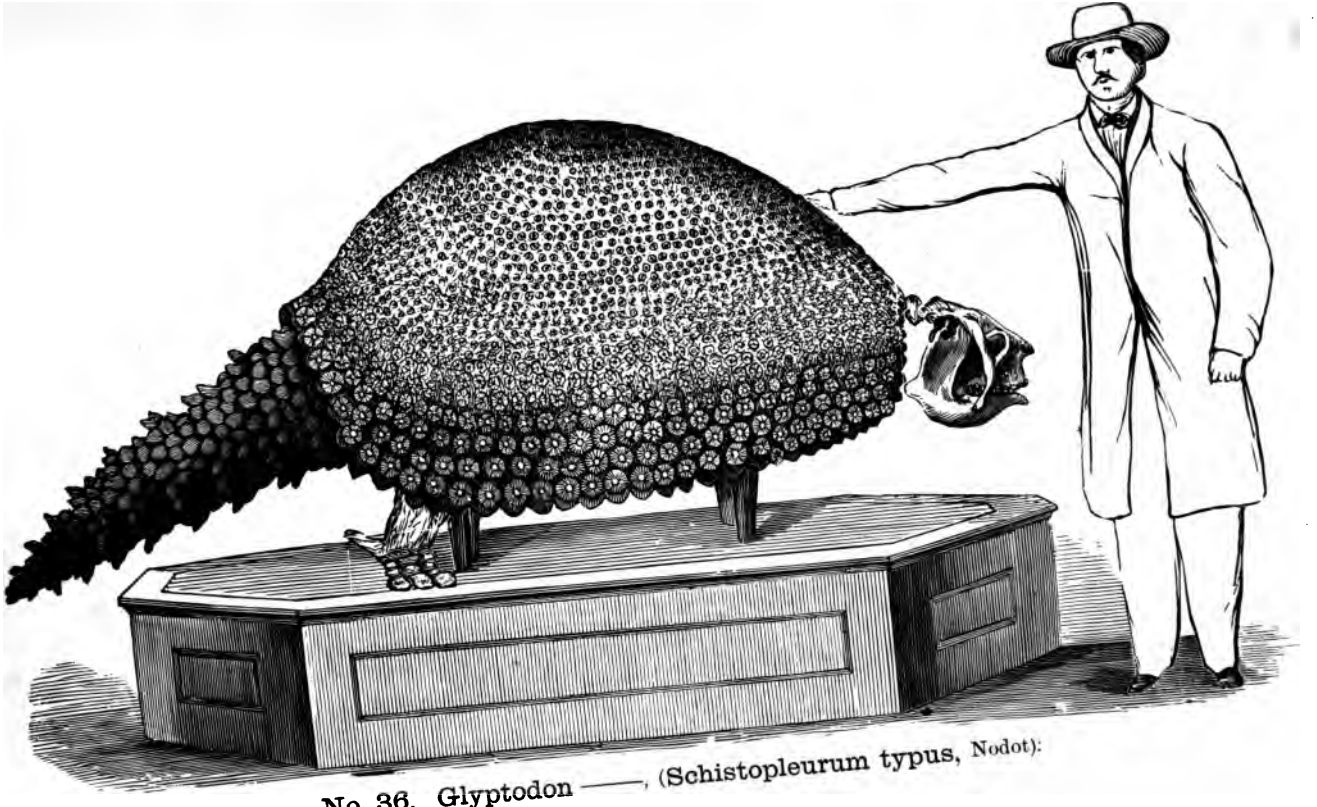
Two CLAWS. The originals were found in a cave in Greenbriar County, West Virginia.

Size, 7 x 4. Price $1.25.

No. 36. **Glyptodon——.** (Schistopleurum typus, Nodot.)

CARAPACE, HEAD, TAIL AND HIND-LEG. This gigantic fossil Edentate was a representative in Pleistocene times of the Armadillos of South America. It was furnished with a huge carapace or coat of mail, formed of hexagonal plates united by sutures, and constituting an impenetrable covering for the upper part of the body and part of the tail. The carapace differs from that of modern Armadillos in having no greaves or joints, for the purpose of contracting or rolling up its body. The head, also, was defended by a tesselated bony casque. The tail possessed an independent dermal sheath or cuirass made up of very prominent tubercles disposed in distinct whorls. This arrangement of the component parts of the sheath permitted a slight flexibility, and made the tail a formidable weapon. The bones of the leg and foot were perfectly adapted to bear the steady pressure of this enormous weight. The latter is admirably contrived to form the base of a column, and at the same time to allow a degree of motion required for the scratching and digging operations of Dasypoid animals. It is pentadactylous, four of the digits being furnished with long flattened nails, similar to those of the Elephant. The teeth, numbering eight on each side of each jaw, are sculptured laterally by two wide and deep channels which divide the grinding surface into three portions. The generic name was derived from this fluting of the molars. The lower jaw is of singular shape, its angle being elevated to a level with the grinding surface of the teeth. But the most remarkable characteristic of the skull is the long, strong process descending from the base of the zygomatic process. The animal measured from snout to the end of the tail, following the curve of the back, eleven feet; the tesselated trunk-armor being six feet eight inches in length and nine feet across. The Glyptodons do not appear to have emigrated from the central regions of South America, but formed a local fauna of the highest interest which is now only faintly represented by the living Armadillos. The carapace of these Edentates probably weighed more than four thousand pounds. The original was found in 1846, near Montevideo, on the banks of the Luxan (Pleistocene). It was presented by order of the Dictator Rosas to Vice-Admiral Dupotet who gave it to the Museum of his native city—Dijon, France, where it is still preserved.

Price of all the parts, with mountings, $150.00.



No. 36. Glyptodon ——, (Schistopleurum typus, Nodot).

No. 37. **Glyptodon** ——, (Schistopleurum typus, Nodot.)

SKULL AND LOWER JAW. Size, 13 x 12. Price, mounted, $15.00.

No. 38. **Glyptodon** ——, (Schistopleurum typus, Nodot.)

TAIL. Size, 3 ft. 9 in. x 1 ft. 4 in. Price, $15.00.

No. 39. **Glyptodon** ——, (Schistopleurum typus, Nodot.)

LEFT TIBIA, FIBULA, AND FOOT. The tibia and fibula are soldered together, and, with the massive club-like foot, formed a firm support while the creature used its forelegs. Size, 15 x 12. Price, with mountings, $7.00.

No. 40. **Glyptodon**——, (Schistopleurum typus, Nodot.)

RESTORED, on reduced scale. Size, 24 x 11. Price, $12.00.

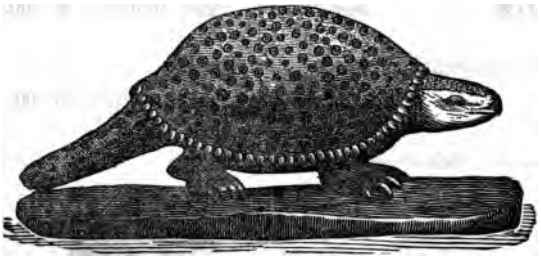
No. 41. **Glyptodon reticulatus**, Owen.

TAIL. This part of the great Armadillo is gently curved with the concavity upward, and consists of caudal vertebræ enclosed in an inflexible sheath composed of closely united dermal plates of various forms and sizes, but disposed in a regular and beautiful pattern. The armor is joined to the internal skeleton of the tail, and the larger plates increase in size as they approach the end of the tail, which is enclosed by a pair something like a bivalve shell. The relation of the endo- and exo-skeletons is finely shown in the specimen. The original, from the Pampas of Buenos Ayres, is in the British Museum. Size, 39 x 9. Price, $8.00.

No. 42. **Glyptodon tuberculatus**, Owen.

TAIL. The club-shaped tail of this species (the *Hoplophorus* of Lund), was likewise discovered in the Pampean formation of Buenos Ayres, and is preserved in the Museum of the Normal School, Paris. Size. 36 x 12. Price, $8.00.

No. 43. **Glyptodon clavipes,** Owen.



RESTORATION. This cast is a complete restoration of the animal on the scale of about two inches to the foot. Size, 24 x 11. Price, $12.

No. 44. **Scelidotherium Cuvieri,** Owen.

SKULL AND LOWER JAW. This Edentate closely resembled the *Megatherium*, but was inferior in size, and had a more slender head. It is particularly distinguished for the enormous breadth of its thigh-bone, whence the generic name. This skull and lower jaw were found with remains of the other great terrestrial Sloths in the Pampas of Buenos Ayres (Pleistocene), and are preserved in the British Museum. Size, 18 x 12. Price, $12.00.

ORDER 6 — RUMINANTIA.

The Ruminants are herbivorous, even-toed, and hoofed. Excepting the Camel tribe and Musk-deer, the males, and sometimes the females, are provided with two horns attached to the os frontis. In the Deer tribe, these horns are of bone, solid, and deciduous; the rest have hollow, corneous horns. The Camel only, has a pair of upper incisors; the hornless Ruminants have canines. The crowns of the molars are marked off by two double crescents, whose convexity is turned inwards in the upper and outwards in the lower. The number of dorso-lumbar vertebræ is generally nineteen. The clavicle and third trochanter are wanting.

The specialized form of hoofed animal with cloven feet and ruminating stomach did not appear till the Miocene Epoch; but there existed in the Eocene certain even-toed Ungulates, *e. g. Anoplotherium*, which in several important characters (hornless foreheads, upper incisors and divided cannon-bones) resembled the embryo of Ruminants, and were probably links connecting the true Ruminants with the Hippopotamus and Hog. They all disappeared during the Pliocene. Fossil species of the Camel, Camelopard, Deer and Antelope are found in the Miocene; the Bovine family first appeared along with the extinct Pachyderms of the older Pliocene; while the Sheep and Goat have been detected only in caverns and superficial deposits.

No. 45. **Camelus Sivalensis,** Falc and Caut.

SKULL. This extinct Camel was related to the existing Bactrian species, but exceeded it by at least one-seventh in height. This fossil skull is in a fine state

of preservation, and was discovered in the Miocene deposits of the Sewalik Hills, India. It is preserved in the British Museum. Size, 10 x 7. Price, $3.50.

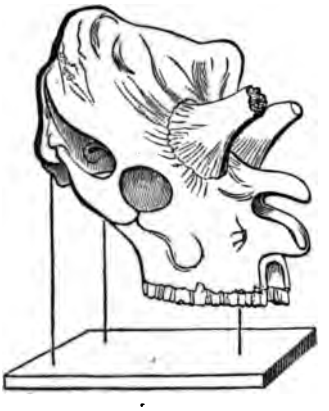
No. 46. **Megaceros Hibernicus,** Owen.

SKULL WITH ANTLERS. This splendid fossil, the most remarkable of the unquestionably extinct species of the Cervine family, and commonly but erroneously called "The Great Irish Elk," is a true Deer, intermediate between the Fallow and Rein-Deer. Though most abundant in, it is not peculiar to, Ireland, many remains having been found in England and the Isle of Man. It was described so long ago as 1796, by Molyneux, who considered it a Moose. The top of the skull of this noble animal, when standing erect, was ten feet from the ground. The antlers, which far surpass those of any living Deer or Elk, have a span of about eight feet; they are branched and palmate, and were undoubtedly shed and reproduced annually. The broad and massive subtriangular palm has a graceful oblique twist, and sends off seven branches. The skull closely conforms to that of the Rein-Deer, but there are no rudiments of upper canines. The vast weight of this antlered skull was supported by cervical vertebræ of extraordinary development. The M. was cotemporaneous with the Mammoth, but probably became extinct before the creation of Man. This skull belongs to a skeleton perfect in all its parts, and of unusually large dimension, which was discovered in the Pleistocene deposits of shell-marl that underlie the peat-bogs in the neighborhood of Limerick, Ireland, and is now in the private Geological Cabinet of Mr. Ward, Rochester. Size of skull, 22 x 10. Price of skull with antlers, packed, $30.00; with mountings, $35.00, (Antlers in nine pieces unpainted.)

No. 47. **Megaceros Hibernicus,** Owen.

SKULL AND LOWER JAW. Size, 22x 10. Price, $6.50.

No. 48. **Sivatherium giganteum,** Falc. and Caut.



SKULL (Male). This singular pachydermoid Antelope exceeded the Rhinoceros in size. The head was very large, broad but short, and carried four horns: the first pair resembled those of the Cow, and was placed just between and above the orbits; behind these was the other pair, palmated and branching, like those of the Elk. The posterior part of the cranium was enormously developed and cellular as in the Elephant. The face was short; the eyes small and lateral; and the nasal bones were prolonged into a pointed arch, indicating a proboscis. The very inclined direction of the front of the face, in relation to the triturating surface of the teeth,

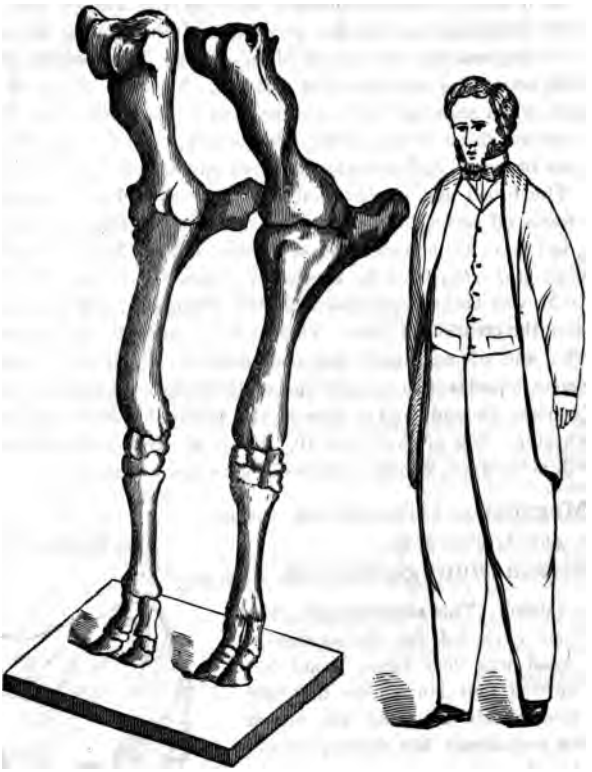
imparts a peculiar physiognomy. The animal must have had a compound stomach, though the teeth seem fitted for bruising and crushing the branches and twigs of trees. The enamel is rugosely furrowed, and the inner crescent presents sinuous plaited flexures. This fossil was discovered in the Valley of Markanda, among the Sewalik Hills of India (supposed to be Miocene), and is now in the British Museum. Size, 21 x 20. Price, with mountings, $15.00.

No. 49. **Sivatherium giganteum,** Falc. and Caut.

SKULL AND LOWER JAW (Female). This skull is smaller than that of the male, and is hornless. Size, 19 x 16. Price, with mountings, $12.00.

No. 50. **Sivatherium giganteum,** Falc. and Caut.

FORE-LEGS.



Size, 5 ft. 8 in. x 2 ft. Price, with mountings, $15.00; without mountings, $10.

No. 51. **Bos (Bison) priscus,** Bojanus.

CRANIUM WITH HORN-CORES. This ancient Bovine is the most nearly represented at the present day by the Aurochs of Lithuania. It is the *Bison latifrons* of Leidy. The forehead is slightly convex, and the horns are very feebly curved. This fossil was found in 1846, in a Pleistocene deposit, Department of Isére, France, and belongs to the Museum of Natural History in Lyons.

Size, 3 ft. 3 in. x 15 in. Price, $8.00.

No. 52. **Bos primigenius,** Boja.

CRANIUM WITH HORN-CORES. This species is supposed to be the same as the *Urus* mentioned by Julius Cæsar in his Commentaries, which, he says, is not much inferior to the Elephant in size (!) Cuvier, Bell, and many other naturalists believe that our domestic cattle are the degenerate descendants of this great Ox. The forehead is concave; and the horns originate at the ends of the ridge which divides the frontal and occipital regions, and describe a double curvature. This specimen was found in 1840, in the Pleistocene banks of the Seille, France, and is in the Museum of Natural History in Lyons.

Size, 3 ft. 10 in x 18 in. Price, $9.00.

No. 53. **Bos primigenius,** Boja.

SKULL WITH HORN-CORES. This remarkably fine specimen, represented in the accompanying engraving, was discovered in a peat-bog (Pleistocene) in Amiens, France, and is preserved in the private Geological Cabinet of Mr. Ward, Rochester. Size, 2 ft. 10 in. x 2 ft. Price, $10.00.

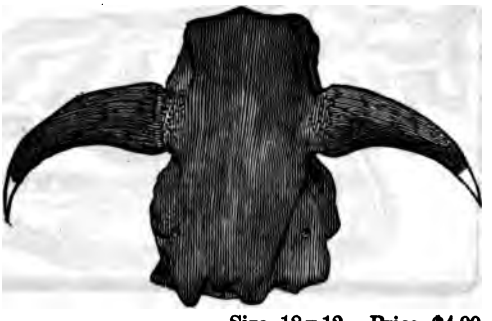
No. 54. **Bootherium cavifrons,** Leidy.

CRANIUM WITH HORN-CORES. In this species, which is closely allied to the Musk-Ox, the frontal bone rises into a prominent process from the sides of which originate the horn-cores. The latter project outwards, downwards, and forwards. The original was found in a gravelly bluff (Pleistocene), near Fort Gibson, on the Arkansas River, and belongs to the Academy of Natural Sciences, Philadelphia.

Size, 24 x 13. Price, $5.00.

No. 55. **Bootherium bombifrons,** Leidy.

CRANIUM WITH HORN-CORES. This species differs from the preceding chiefly in the less development of the frontal ridge, and in the shape of the process which rises gradually into a hump. The specimen was found in the Pleistocene morasses of Big-bone Lick, Kentucky, and is in the Academy of Natural Sciences, Philadelphia.



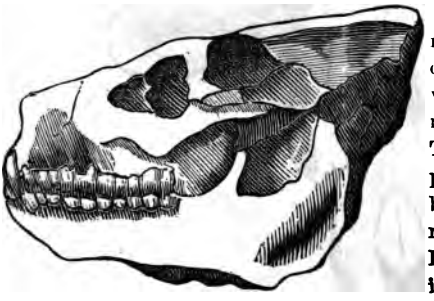
Size, 18 x 12. Price, $4.00.

No. 56. **Pœbrotherium Wilsonii**, Leidy.

SKULL AND LOWER JAW. This specimen belonged to an individual just reaching adult age. The form of the head, if restored, would probably most approach that of the existing Musks. The ramus of the lower jaw is remarkable for its breadth and for an angular apophysis as in the Camel, Carnivores and most Rodents. The P. had three molars and four premolars in each ramus of both jaws, and probably two upper canines and eight lower incisors. The original was discovered in 1847, in the Mauvaises Terres (Miocene or White River Group), Nebraska, and is preserved in the Academy of Natural Sciences, Philadelphia.

Price, $1.75.

No. 57. **Oreodon Culbertsonii**, Leidy.



SKULL AND LOWER JAW. This remarkable Ungulate constitutes one of the links necessary to fill up the wide gap between existing Ruminants and the extinct Anoplotheria. The form of the cranium proper approaches that of the Camel; but generally the skull bears most resemblance to the Anoplotherium. It differs strikingly from the latter in the existence of post-orbital arches, in the greater size of the orbits, and in the presence of deep lachrymal depressions. The sagittal crest is prominent; and the forehead is convex. The molars have a ruminant character; while canines and incisors exist in both jaws and form with the molars almost unbroken rows. The dentition appears to characterize a ruminating Hog. This specimen was found in the Mauvaises Terres (Lower Miocene) of Nebraska, and is in the Academy of Natural Sciences, Philadelphia.

Size, 8 x 5. Price, $2.00.

No. 58. **Oreodon major**, Leidy.

SKULL. This species differs apparently only in size. It was found in the Mauvaises Terres (Lower Miocene) of Nebraska, and is in the Academy of Natural Sciences, Philadelphia.

Size, 11 x 7. Price, $2.00.

No. 59. **Anoplotherium commune**, Cuvier.

HEAD ON SLAB. This two-toed Ruminant was about the size of a Fallow-Deer. It had a long and strong tail, and was probably of aquatic habits. It was hornless, and had separate metacarpal and metatarsal bones. But it is chiefly remarkable

for the completeness and regularity of its teeth. It has the typical number 44,—neither canine nor any other tooth rising above the general level, and the series is unbroken, a character now manifested only by Man. The grinding surface of the molars retains the transitory and embryonic structure of the ruminant type. The generic name has reference to the absence of tusks, long canines, horns and claws. This very perfectly preserved head is from the Eocene Gypsum Beds of Montmartre, Paris, and is now in the Garden of Plants.

Size, 15 x 9. Price, $5.50.

No. 60. **Anoplotherium commune**, Cuv.
RIGHT FORE-FOOT ON SLAB. Size, 11 x 5. Price, $2.25.

No. 61. **Anoplotherium commune**, Cuv.
LEFT HIND-FOOT ON SLAB. Size, 12 x 4. Price, $2.25.

No. 62. **Merycopotamus dissimilis**, Falc. and Caut.
LOWER JAW, RIGHT RAMUS. The exact position of this extinct animal has not been determined, but it seems to stand on the border-line between Ruminants and Omnivores. The molars resemble those of the Oreodon, but the rest of the dentition approaches that of the Hippopotamus. The fossil was found in the Sewalik Hills (Miocene), and is preserved in the British Museum.

Size, 14 x 4. Price, $1.75.

ORDER 7 — PACHYDERMATA.

The Pachyderms are non-ruminant Herbivores. None have clavicles, nor more than forty-four teeth. All that are odd-toed behind have a third trochanter on the femur. Many of them by their size, cranial characters and life by the river and marsh, show an intermediate position between the aquatic and terrestrial Mammalia. There are three groups, each tending toward some other Order. The *Proboscideans* approach the Rodents. They embrace the largest of all terrestrial creatures, and are characterized by a proboscis, tusks, the absence of canines, a few large, transversely ridged molars, and pentadactyle feet, indicated only by divisions of the hoof. The dorso-lumbar vertebræ number more than nineteen. The only living Proboscideans are two species of *Elephas—Indicus* and *Africanus*. The total number of teeth they develop is thirty-two: the two permanent incisors or tusks being preceded by two deciduous one, and the number of molars (which succeed each other not vertically but from behind forwards) is finally reduced to one in each ramus. The African species most nearly approaches the Mammoth in the structure of its teeth and general proportions. The *true Pachyderms* approximate to the Ruminants. They have two, three

or four toes on the hind foot, and their dentition is still more various. The Hog is one of the few existing quadrupeds which retain the typical number and kinds of teeth, the formula being : $i \frac{3-3}{3-3}$ $c \frac{1-1}{1-1}$ $m \frac{7-7}{7-7} = 44$. The *Solidungulates* also approach the Ruminants, particularly the Camel. The canines are rudimentary or wanting in the females.

The Pachyderms were created at the dawn of the Tertiary Period. The earliest of elephantoid mammals was the *Mastodon*, which appeared in the Miocene. It was one of the first fossil animals by whose remains naturalists were convinced of the possibility of extinct species. But the earliest Pachyderm introduced upon our planet was a porcine beast—the *Chœropotamus*. The hoofed Herbivore, *Coryphodon*, if numbered with the Pachyderms, would dispute this honor. None of the Equine race appear to be older than the Miocene (Sewalik Hills).

No. 63. **Sus scrofa**, Meyer.

SKULL. This species was cotemporary with the Mammoth, and cannot be distinguished from the present Wild Boar. The fossil was found in a cave at St. Didier, France, and is now in the Museum of Natural History in Lyons. Size, 16 x 7. Price, $4.00.

No. 64. **Sus giganteus**, Falc. and Caut.

SKULL. This specimen, discovered in the Sewalik Hills, India (Miocene), is preserved in the British Museum. Size, 12 x 9. Price, $3.50.

No. 65 **Sus erymanthius**, Wagn.

PALATE AND TEETH. This specimen from a Pleistocene deposit in Pikermi, Greece, is in the University Museum at Munich. Size, 9 x 4. Price, $2.25.

No. 66. **Sus scrofa**, Meyer.

MOLAR. This specimen shows the characteristic tuberculate surface formed by the wrinkled enamel. Price, $0.30.

No. 67. **Chœropotamus affinis,** Gervais.

UPPER JAW of a young animal. The C. was the earliest form of the Hog-tribe introduced upon our planet. When adult, it must have resembled the Peccari, but was about one-third larger. "It presents an interesting example of one of those links, completing the chain of affinities, which the revolutions of the earth's surface have interrupted, as it were, and for a time concealed from our view." It had the typical dentition. This jaw, discovered in 1856 in the lignites (Eocene) of Débruge, France, is now in the Museum of Natural History at Lyons.

Size, 6 x 3. Price, $1.50.

No. 68. **Chœropotamus affinis,** Gerv.

LOWER JAW of a young animal. In the form and proportions of the lower canines, and the backward prolongation of the angle of the jaw, the C. manifests an approximation to the carnivorous type: no other hoofed Mammal presents the latter conformation. This specimen was found, and is preserved with the preceding.

Size, 8 x 3. Price, $1.50.

No. 69. **Chœropotamus Parisiensis,** Cuv.

SKULL. This fossil was discovered in the Eocene Gypsum beds of Mont martre, Paris, and is preserved in the Museum of the Garden of Plants.

Size, 12 x 6. Price, $3.25.

No. 70. **Entelodon magnum,** Aymard.

LOWER JAW, with pedestal. This Pachyderm is characterized by six subtriangular incisors in each jaw, by canines slightly curved and turning outwards, by seven molars in each ramus, and by tetradactylous feet. Like the *Chœropotamus*, this animal had features allying it to the Hog on the one side, and to the Hippopotamus on the other. This specimen was found in the Lower Miocene at Agen, Southern France, and is now in the Museum of the Garden of Plants.

Size, 18 x 13. Price, $7.50.

No. 71. **Anthracotherium magnum,** Cuv.

PALATE AND LOWER JAW. The complete skeleton of this Pachyderm has not yet been found; but so far as determined, the genus seems to stand between the Hog and Hippopotamus. Remains were first found in the Brown Coal of Piedmont; whence the name. These were discovered in the Miocene of Auvergne, France, and are now in the Garden of Plants. Size, 24 x 18. Price, $9.00.

No. 72. **Lophiochærus splendens.**

UPPER AND LOWER JAWS, RIGHT RAMI, with pedestal. These specimens were discovered in 1861, in the Lower Miocene at St. Alban, France, and are in the Museum of Natural History at Lyons. Size, 6 x 4. Price, $2.00.

Mo. 73. **Hippohyus Sivalensis,** Falc. and Caut.

SKULL. This Pachyderm, like the *Chœropotamus* and *Anthracotherium*, had the typical dental formula now preserved in the Hog. The skull was found in the Miocene formation, Sewalik Hills, India, and is in the British Museum.

Size, 9 x 4. Price, $1.75.

No. 74. **Hexaprotodon Sivalensis,** Falc. and Caut.

SKULL AND FRAGMENT OF LOWER JAW. This animal was essentially a Hippopotamus with six incisors, instead of four, in each jaw. A specific distinction is the shortness of the face. These remains were found in the Miocene of the Sewalik Hills, India, and belong to the British Museum.

Size, 24 x 16. Price, $9.00.

No. 75. **Hexaprotodon Sivalensis,** Falc. and Caut.

FRAGMENT OF LOWER JAW. (The complement of No. 74.)

Size, 11 x 10. Price, $3.00.

No. 76. **Tetraprotodon palæindicus,** Falc. and Caut.

SKULL. This extinct Pachyderm closely resembles the living Hippopotamus. Its skull was found in the Sewalik Hills, India (Miocene), and is now in the British Museum. Size, 19 x 16. Price, $6.50.

No. 77. **Hippopotamus ——**

MOLAR. The crown of the tooth is divided into two lobes by a wide transverse valley, and each lobe is subdivided by a narrow antero-posterior cleft into two half-cones with their flat sides next each other. The original is in the Museum at Darmstadt. Price, $0.50.

No. 78. **Hippopotamus major,** Cuv.

RIGHT TUSK. This tusk, from the right ramus of the lower jaw, is of a size which marks it as belonging to an animal much larger than any H. of the present day Size, following curve of tooth, 17 x 7. Price, $1.50.

No. 79. **Hippopotamus major,** Cuv.

LEFT HIND-FOOT. From the Pliocene Tertiary beds of Auvergne. Remains of this interesting genus of Pachyderm animals have been found in England, and very widely distributed through both Europe and Africa. It does not seem, however, in either of these continents to have frequented points as far to the North as did the Rhinoceros. The H. major had peculiarities in its dentition which distinguished it from the modern species, and it was also nearly twice as large. This foot is quite perfect in preservation.

Size, 1 ft. 9 in. x 11 in. Price, on pedestal, $3.75.

No. 80. **Equus namadicus,** Falc. and Caut.

SKULL. This is one of the three new species of fossil Horse found by Falconer and Cautley in the Miocene deposits of the Sewalik Hills, India, associated with gigantic Pachyderms, Ruminants, aud Carnivores. The specimen is in the British Museum. Size, 18 x 8. Price, $5.00.

No. 81. Equus fossilis.

MOLAR. Remains of the fossil Horse have been found in the uppermost Tertiaries and the Quarternary of many parts of Europe and America. These remains are in the main molar and incisive teeth which are usually noted under the name of E. fossilis, although some authors undertake to distinguish several species. This specimen is from the Pliocene beds of Suffolk, England. Original in the private Geological Cabinet of Mr. Ward, Rochester.

Price, $0.20.

No. 82. Hippotherium gracile, Wagn.

LEFT HIND-LEG, on pedestal. This extinct Soliped—the *Equus primigenius* of Meyer—ranged from the Himalayas to the Alps, and existed from the Miocene period to the Diluvium. It was about as large as the Deer, and had remarkably long, slender legs. These remains, comprising the lower part of the tibia, tarsus, and principal metatarsals and phalanges, were found in the Pleistocene strata at Pikermi, Greece, and belong to the University Museum at Munich.

Size, 21 x 9. Price, $5.50.

No. 83. Hipparion elegans, Christol.

LEFT HIND-FOOT. This little equine quadruped was tridactyle; for while the two splint-bones alone are retained in the Horse, Zebra and Ass, in the H. they terminated in small digits and hoofs. Such a foot was better adapted for swampy soil, as it would not sink so deeply. The hoofs dangled behind like the spurious hoofs of the Ox. The H. was a transitional form between the Upper Eocene Palæotheres and the modern Horse. This specimen was found in the Lower Pliocene at Cucurron, France, and belongs to the Museum of Natural History in Lyons. Size, 14 x 13. Price, $2.25.

No. 84. Hipparion primigenius.

FRAGMENT OF PALATE WITH FOUR TEETH. From the Lower Pliocene of Cucurron, France. Museum of Natural History in Lyons. Price, $1.00.

No. 85. Anchitherium Bairdii, Leidy.

SKULL AND LOWER JAW. This odd-toed Ungulate resembles the Palæotherium in its dental structure, but is very much like the Horse in its skeleton. The cranium has a short sagittal crest and a large, broad forehead; the skull is relatively shorter than that of the Horse; each jaw contains six incisors, two canines, and seven molars. These remains were found in the Mauvaises Terres (Lower Miocene), Nebraska, and are preserved in the Museum of the Academy of Natural Sciences, Philadelphia. Size, 6 x 4. Price, $2.25.

No. 86. **Anchitherium Aurelianense,** Gerv.

PALATE WITH DOUBLE RANGE OF TEETH. This species, the *Palæotherium Aurelianense* of Cuvier, was larger than the preceding. The specimen was found in an oolitic limestone at St. Alban, France (Upper Miocene), and belongs to the Museum of Natural History at Lyons. Price, $2.00.

No. 87. **Anchitherium Aurelianense,** Gerv.

LOWER JAW, RIGHT RAMUS. This fossil was found in 1861 in the same locality as the preceding, and is preserved in the same Museum.

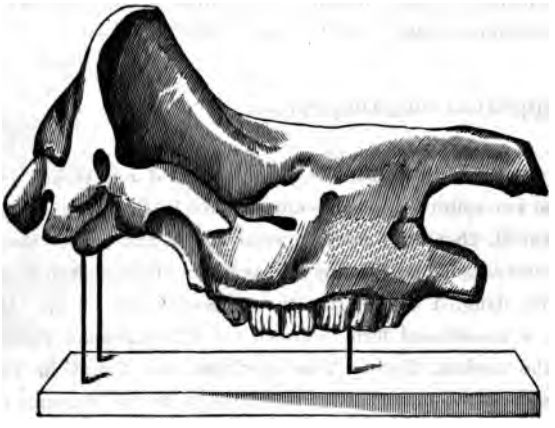
Size, 7 x 2. Price, $1.00.

No. 88. **Rhinoceros Etruscus,** Falc.

SKULL AND LOWER JAW. This very perfect specimen is from the Diluvium of the Val d' Arno, Tuscany. The original is in the University Museum at Pisa.

Size, 20 x 14. Price, mounted, $15.00.

No. 89. **Rhinoceros platyrhinus,** Falc. and Caut.



SKULL. This is one of the four new species brought to light by the researches of Falconer and Cautley in that sepulchre of gigantic Mammals—the Miocene deposits in the Sewalik Hills, India. This skull is now in the British Museum.

Size, 30 x 18. Price, with mountings, $15.00.

No. 90. **Rhinoceros palæindicus,** Falc. and Caut.

SKULL. This specimen is from the same locality as the above, and is preserved in the same Museum. Size, 18 x 10. Price, $6.00.

No. 91. **Rhinoceros pleuroceros,**

SKULL. The original, discovered in the Miocene at Gannat, France, is in the Museum of the Garden of Plants. Size, 18 x 8. Price, $5.50.

No. 92. **Rhinoceros megarhinus,** Chris.

SKULL. This relic of a Pliocene Rhinoceros was discovered in 1861, near Moras, France, and is now in the Museum of Natural History at Lyons.

Size, 25 x 11. Price, $10.00.

No. 93. **Rhinoceros brachypus,** Lart.

UPPER JAW, LEFT RAMUS. This fossil, which probably belongs to the *R. brachypus*, was found in 1861, in an oolitic, Lower Miocene formation, at St. Alban, France, and is in the Museum of Natural History in Lyons.

Size, 12 x 7. Price, $3.25.

No. 94. **Rhinoceros insignis.**

LOWER JAW. This specimen was found in the Miocene at Gannat, France, and is in the Museum of Natural History at Lyons. Size, 12 x 5. Price, 3.50.

No. 95. **Rhinoceros pleuroceros.**

LOWER JAW, PART OF LEFT RAMUS. From the same locality.

Size, 8 x 4. Price, $1.25.

No. 96. **Rhinoceros Schleiermacheri,** Kaup.

LOWER JAW, LEFT RAMUS. This specimen, from the Upper Miocene of Central France, is in the Garden of Plants. Size, 21 x 11. Price, $2.50.

No. 97. **Rhinoceros ————**

UPPER JAW, RIGHT RAMUS. With seven molars.

Size, 10 x 4. Price, $2.00.

No. 98. **Rhinoceros tichorinus?** Cuv.

TWO MOLARS FROM UPPER JAW, showing the folds of the enamel. From the Diluvium of France. Originals in the Ward Museum, University of Rochester. Price, $0.60.

No. 99. **Rhinoceros Merkii,** Kaup.

MOLAR. This specimen—smaller and narrower than the preceding—shows the folding of the enamel and the resultant figure of the crown-surface in molars from the lower jaw. From a lacustrine deposit (Miocene) at Steinheim, Wirtemberg. Original in Mr. Ward's private Geological Cabinet.

Price, $0.30.

No. 100. **Rhinoceros incisivus,** Cuv.

UPPER INCISOR. From Miocene beds of Steinheim, Germany. Price, $0.50.

No. 101. **Rhinoceros megarhinus,** Chris.

LEFT TIBIA. This specimen from the Upper Pliocene at Montpelier, France, is also in the Museum at Lyons. Size, 17 x 6. Price, $2.00.

No. 102. **Tapirus Arvernensis,** Croiz. and Job.

PALATE AND JAW. This extinct Pachyderm differed little from the Tapir of Sumatra. The molars show the same bilophodont or two-ridged type. The upper jaw, when full, contains seven molars, one canine, and three incisors. This specimen was found in the Pliocene of Auvergne, Central France, and is in the Garden of Plants. Size, 9 x 12. Price, $2.50.

No. 103. **Tapirus Arvernensis,** Croiz. and Job.

LOWER JAW. This contains six molars, and is from the same locality.
Size, 11 x 6. Price, $2.25.

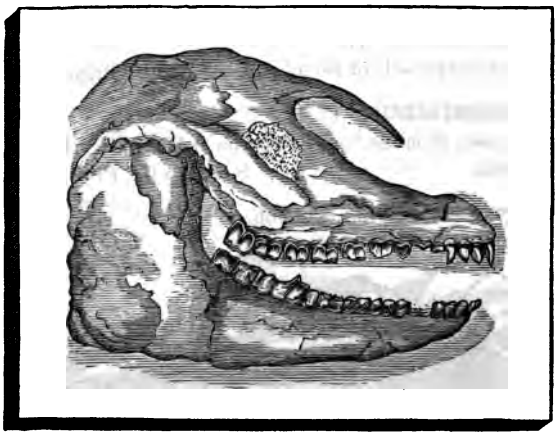
No. 104. **Lophiodon Parisiense,** Gerv.

LOWER JAW. This tapiroid Mammal, the *Tapirotherium* of De Blainville, is known only by imperfect fragments, though Cuvier established the genus so early as 1800. It has the same dental formula as the Tapir; but the premolars present a more simple structure, the lower series having the crown compressed and forming two cones, and the last two in the upper jaw having only one cone on the inner side. This jaw was found in the calcaire grossier (Middle Eocene) near Paris, and is in the Garden of Plants. Size, 13 x 6. Price, $4.00.

No. 105. **Pliolophus vulpiceps,** Owen.

SKULL AND LOWER JAW. This odd-toed, hoofed Herbivore stood intermediate between the Tapir and Palæotherium. The skull has a straight upper contour like that of the Horse; while that of the Palæotherium and Anoplotherium is convex. As in the Hog and Palæotherium, the greatest cerebral expansion is at the middle and toward the fore-part of the temporal fossæ, with a contraction toward the occiput. The orbit is higher than in the Rhinoceros, and lower than in the Hog. The dentition is like that of nearly all Eocene quadrupeds, a type not exhibited by any later or existing Mammal, namely: three incisors, one canine, four premolars, and three molars in each ramus. This interesting fossil was discovered in the London Clay (Eocene) of England, and is now in the British Museum. Price, $1.25.

No. 106. **Palæotherium crassum,** Cuv.



HEAD. The discovery of the P.—one of the most characteristic Mammals of the Tertiary world—formed an epoch in the history of fossils. The creature resembled the Tapir in the shape of the head and the possession of a short proboscis; but it had only three toes on the forefoot, and the molars resembled in form those of the Rhinoceros, though agreeing in number, kind, and general arrangement with the dentition of the *Pliolophus*. The canines were longer than the other teeth, and there were consequently vacancies in the series for the lodgment of the crowns

of the canines when the mouth was shut. The upper canine was placed in advance of the lower one as in the *Oreodon*,—an anomalous position. This species is characterized by a long nasal bone, and by short thick feet. The fossil head, now in the Museum of the Garden of Plants, was discovered in the Eocene Gypsum of Montmartre, Paris. Size, 13 x 10. Price, $5.50.

No. 107. **Palæotherium crassum,** Cuv.

SKULL SHOWING BRAIN. The cranial cavity was filled with mud which, on the decomposition of the skull, has left a stony cast of the brain with its convolutions. The original is in the Garden of Plants. Size, 12 x 7. Price, $2.00.

No. 108. **Palæotherium girondicum,** Blainv.

UPPER JAW, RIGHT RAMUS. This specimen from the Lower Miocene of Grave (Dordogne), France, shows the seven molars and the canine, all in place. Original in the Garden of Plants. Size, 10 x 4. Price, on pedestal, $2.00.

No. 109. **Palæotherium crassum,** Cuv.

LOWER JAW. Original in the Garden of Plants.—Size, 10 x 6. Price, $3.50.

No. 110. **Palæotherium velaunum,** Cuv.

LOWER JAW. This species is founded on some peculiarities in the lower jaw. The specimen was found in the Eocene Gypsum of Puy de Dome, Central France, and is in the Garden of Plants. Size, 6 x 3. Price, $2.00.

No. 111. **Palæotherium crassum,** Cuv.

LEFT HIND-FOOT.—Size, 13 x 5. Price, $2.25,

No. 112. **Dinotherium giganteum,** Kaup.

SKULL AND LOWER JAW. This huge Pachyderm, though its teeth were discovered more than a century ago, has not yet found a resting-place in the classification of animals. Cuvier called it a gigantic Tapir; De Blainville and Pictet consider it an aquatic Herbivore, resembling the Dugong, and inhabiting the embouchures of great rivers; Kaup regards it as intermediate between the Tapir and Mastodon, and truly terrestrial; while Owen says, that, "in the general shape of the skull and aspect of the nostril, the D. most resembles the Manatee, but bones of the limb have been found so associated with teeth as to determine the D. to be a hoofed quadruped of probably aquatic habits, and transitional as it

would seem between the large Lophiodons and the huger Proboscidians." To complicate the matter still further, there has been discovered in the Department of the Haute-Garonne in Southern France, an immense fossil pelvis, supposed to belong to the D. [See *American Journal of Science* for November, 1864.] It is five feet eleven inches from one crest to the other of the iliac bones, and four feet three inches in a line cutting it vertically. In its lower portion are two subtriangular depressions which are evidently articulating cavities, in which fitted

marsupial bones. It may be, therefore, that the D. was a marsupial; although it is still as uncertain as before to what exact order of animal this didelphic feature was in this case added. The skull, scapula, femur and pelvis (?) are the only parts of the D. yet discovered. The scapula resembles that of a Mole. The skull is characterized by a very flat occipital bone (approximating in form the occiput of Cetacea), large nasal aperture opening above, and large suborbital fossæ, which, together with the form of the nose, seem to indicate the presence of a short pro-

boscis. The teeth, numbering five in each ramus, are all molars, and belong to the two-ridged type, as in the Tapir, Megatherium, Kangaroos, and Manatee. The first two answer to the third and fourth premolars. The enormous down-curving tusks are, in fact, two huge recurved incisors implanted in a prolongation of the symphysis of the lower jaw. They were retained in both sexes. "They were probably useful (says Ansted), as pickaxes, enabling the monster to dig for succulent vegetable food by day, while, perhaps, at night they could be attached like anchors to the banks of the river or lake in which the animal habitually dwelt." Cuvier and Kaup calculated that the D. must have attained the extraordinary length of eighteen feet. Its body, doubtless, resembled that of the Hippopotamus, being little raised above the ground, although the huge columns which formed its legs are supposed to have been nearly ten feet in length. Remains of this genus have been found in the Miocene deposits of Germany, France, Bavaria, Austria, America, and Perim Island, associated with the Hippopotamus, Horse, Ox, Antelope, Ape, Hog, Dog, Wolf, Cat, Lamantin, Morse, Sea-Calf and Dolphin—all of extinct species. This magnificent fossil, the head of the *Dinotherium giganteum*, was discovered by Dr. Klipstein, near Eppelsheim, Rhine Valley, in a bed of Miocene sand and marl, containing marine shells, and is now in the Museum at Darmstadt.

Size, 4 ft. 8 in. x 4 feet. Price, with mountings, $80.00.

No. 113. **Dinotherium giganteum,** Kaup.

SKULL AND LOWER JAW, REDUCED.

Size, 16 x 16. Price, with pedestal and mountings, $15.00.

No. 114. **Dinotherium Cuvieri,** Kaup.

UPPER JAW, LEFT RAMUS. This fragment contains two molars. It was found in the Lower Miocene, near Blois, France, and is in the Museum of Natural History at Lyons. Size, 6 x 5. Price, $1.25.

No. 115. **Dinotherium levius.**

UPPER JAW, LEFT RAMUS. This fragment contains the three anterior molars. It was found in the Middle Miocene at St. Donat Drome, France, and belongs to the Museum at Lyons. Size, 11 x 6. Price, $2.25.

No. 116. **Dinotherium levius.**

LOWER JAW. This specimen was discovered in 1861, in the Lower Miocene, St. Albans, France, and belongs to the Museum of Natural History at Lyons.

Size, 3 ft. 6 in. x 2 ft. 3 in. Price, $25.00.

No. 117. **Dinotherium Americanum.**

LOWER JAW, on pedestal. This relic of a Dinothere that once lived by the swamps and estuaries of the New World, belongs to the Museum of the Academy of Natural Sciences at Philadelphia. Size, 20 x 19. Price, $10.00.

No. 118. **Dinotherium levius.**

RANGE OF FIVE MOLARS, UPPER JAW, LEFT RAMUS. These were found in the Lower Miocene at St. Albans, France, and are in the Museum at Lyons.

Size, 14 x 5. Price, $2.50.

No. 119. **Dinotherium levius.**

UPPER MOLARS, FULL SET. From the same locality and Museum.

Size, 12 x 11. Price, $3.50.

No. 120. **Dinotherium levius.**

THREE ANTERIOR MOLARS, LOWER JAW, RIGHT RAMUS. From the same locality and Museum. Size, 6 x 2. Price, $1.50.

No. 121. **Dinotherium levius.**

THREE ANTERIOR MOLARS, UPPER JAW, RIGHT RAMUS. From the same locality and Museum. Size, 6 x 2. $1.50.

No. 122. **Dinotherium giganteum,** Kaup.

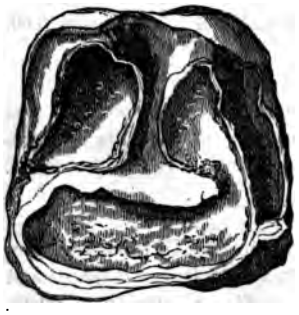
LAST TWO MOLARS. They were found in a Miocene deposit at Frohnstetten, Wirtemberg, and are in the University Museum of Munich.

Size, 7 x 3. Price, $1.00.

No. 123. **Dinotherium giganteum,** Kaup.

FOURTH LOWER MOLAR, LEFT RAMUS. This was found in the Upper Miocene, near Lyons, France, and belongs to the Museum of Natural History in that city. Price, $0.50.

No. 124. **Dinotherium giganteum,** Kaup.



SECOND UPPER MOLAR, LEFT RAMUS. This tooth, from the Upper Miocene at St. Jean le Vieux, France, is also in the Lyons Museum.

Price, $0.60.

No. 125. **Dinotherium giganteum,** Kaup.

FIRST UPPER MOLAR, LEFT RAMUS. This is from the same locality and Museum. Price, $0.60.

No. 126. **Dinotherium giganteum,** Kaup.

MOLAR. Price, $0.50.

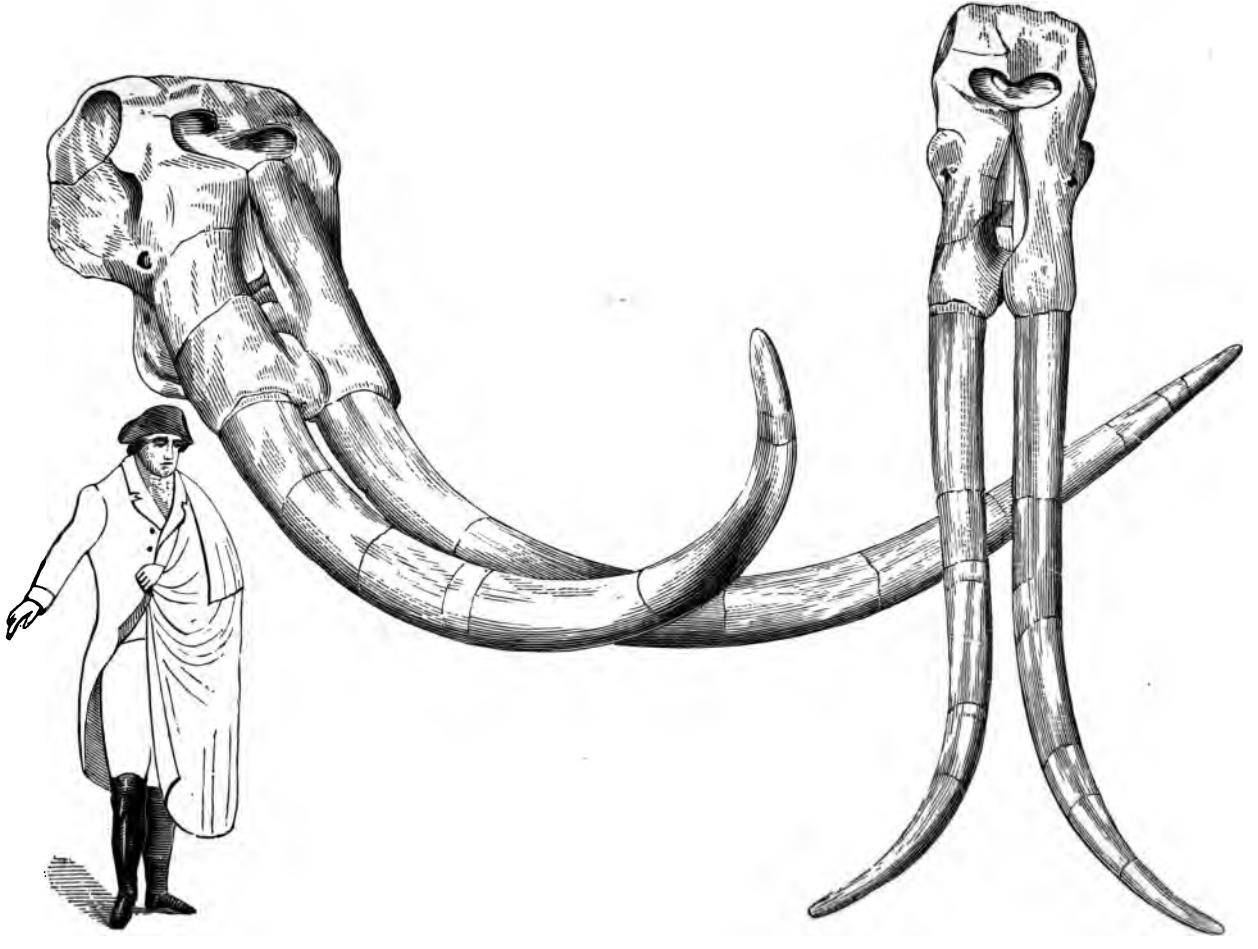
No. 127. **Dinotherium giganteum,** Kaup.

FEMUR. This is the largest thigh-bone known to naturalists. The original was found at Epplesheim, and is in the Museum at Darmstadt.

Size, 5 ft x 15 in. Price. $9.00.

No. 128. **Elephas Ganesa,** Falc. and Caut.

SKULL WITH TUSKS. This remarkable Asiatic Elephant, long ago extinct, is distinguished by a pair of tusks ten and a half feet in length, and twenty-six



No. 128. Elephas Ganesa

inches in circumference at the base. In consequence of their slight curvature, they project eight feet five inches in front of the head. The length of the skull is four feet two inches; width, twenty-nine inches. The apparent disproportion of the tusks to the size of the skull is truly extraordinary, and exemplifies the maximization of dental development. By this great leverage they must have added to the skull of the living animal a weight of nearly two thousand pounds. The molars present seven or eight ridges, and the valleys between are filled with a large quantity of cement. The original, preserved in the British Museum, was discovered in that classical palæontological ground—the Sewalik Hills of India—in a Miocene deposit, consisting of concretionary grit, conglomerate, sandstone, and loam, and containing lignite, trunks of dicotyledonous trees, and land and fresh-water shells. Price, with mountings, and packed, $80.00.

No. 129. **Elephas bombifrons,** Falc. and Caut.

SKULL. From the same locality and Museum as *Elephas Ganesa.*

Size, 3 ft. x 1 ft. 10 in. Price, $22.00.

No. 130. **Elephas Hysudricus,** Falc. and Caut.

SKULL. This species is an intermediate form between Falconer's subgenera—*Loxodon* and *Euelephas.* The specimen was found in the Miocene of the Sewalik Hills, India, and is in the British Museum.

Size, 2 ft. 4 in. x 2 ft. 2 in. Price, $22.00.

No. 131. **Elephas meridionalis,** Nesti.

LOWER JAW. From Diluvium of the Val d'Arno, Tuscany. The original specimen is in the Museum of the University of Pisa.

Size, 2 ft. 6 in. x 1 ft. 8 in.

No. 132. **Elephas primigenius,** Blum.

LOWER JAW, YOUNG. This is the latest form of true Elephant which lived in a temperate latitude, and is the best known of all the fossil species. The range of the animal was apparently between the 40th and 70th parallels of latitude; and its remains are found chiefly, if not exclusively, in Pleistocene deposits. The inhabitants of Siberia call it *Mammoth,* or subterranean Mole, believing that it lived under ground. It is not a little singular that Darwin found a theory held by the people of the Pampas that the *Mastodon* was a burrowing animal. The primeval Elephant was over twice the weight of the largest living species, and nearly a third taller. It had broader grinders, and narrower and more numerous and close-set transverse plates and ridges; a more parallel position of the right and left sockets of the grinders; a greater length of the sockets of the tusks; a larger and more prominent tubercle of the lachrymal bone; and more angular and relatively shorter zygomatic processes. Moreover, the outer contour of one ramus meets that of the other at a more open angle. In the structure of the molars, this species comes nearer the Indian Elephant than the African, the plates being disposed in nearly parallel lines. But the tusks have a bolder and more extensive curvature: some

have been found which describe a circle, but the curve being oblique, they thus clear the head, and point outward, downward and backward. The cranium of the *Elephas primigenius* is elongated and the forehead concave. A lower molar can be distinguished from an upper one by the grinding surface being slightly concave in the direction of its longest diameter, that of the upper molar being in the same degree convex. Most of the molars of the New World Mammoth are characterized by thinner and more numerous plates than those of England, but the difference is not constant. The creature was covered with shaggy hair, so that it was fitted to live as near the pole as is compatible with the growth of hardy trees or shrubs. The sterile region in Northern Siberia, where the remains occur so abundantly, was, according to Murchison, beneath the sea at the period when the Mammoth lived; the bones and carcases therefore must have drifted thither. It should be mentioned, however, that the remains are rarely rolled or water-worn. This lower jaw, belonging to a young animal, was disinterred from a Pleistocene deposit at Lippe, Rhenish Prussia, and is in the University Museum at Bonn, Rhine Valley. It is a very perfect specimen, and retains the molar teeth in place.

Size, 12 x 12. Price, $3.00.

No. 133. **Elephas primigenius,** Blum.

LOWER JAW, YOUNG. This specimen was found in 1835, in a Pleistocene deposit in the Department of Ain, France, and is now in the Museum of Natural History at Lyons. Size, 12 x 10. Price, $3.00.

No. 134. **Elephas intermedius.**

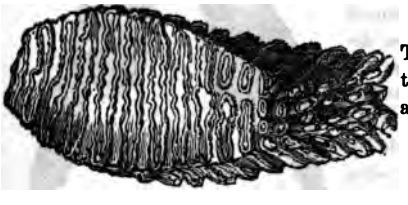
LOWER JAW. This specimen is from the Pleistocene in the Parish of Eculy, near Lyons, France, and is in the Museum of that city.

Size, 2 ft. 3 in. x 25 in. Price, $8.00.

No. 135. **Elephas intermedius.**

LOWER JAW. This jaw was found in the Pleistocene at Lyons, and is in the Museum of that city. Size, 21 x 17. Price, $6.00.

No. 136. **Elephas intermedius.**



SIXTH UPPER MOLAR, LEFT RAMUS. This grinder was found in the Pleistocene on the banks of the Saône, France, and is in the Museum at Lyons.

Size, 13 x 8. Price, $2.50.

No. 137. **Elephas intermedius.**

SIXTH LOWER MOLAR, LEFT RAMUS. This grinder was found in the Pleistocene at St. Germain, France, and is in the Museum at Lyons.

Size, 11 x 6. Price, $2.00.

No. 138. **Elephas meridionalis,** Nesti.

FIFTH UPPER MOLAR, RIGHT RAMUS. This species is characterized by a very long symphysis to the lower jaw, and by molars similar to those of the African Elephant. This tooth was found in the Upper Pliocene, in the Lower Alps, France, and is in the Museum at Lyons. Size, 8 x 5. Price, $1.75.

No. 139. **Elephas meridionalis,** Nesti.

FIFTH UPPER MOLAR, RIGHT RAMUS. This is from the Upper Pliocene, at Chagny, France, and is in the Museum at Lyons. Size, 6 x 4. Price, $1.25.

No. 140. **Elephas primigenius,** Blum.

SIXTH MOLAR, UPPER JAW, RIGHT RAMUS. This was found in a Pleistocene stratum at Ranelle, France, and is in the Museum at Lyons.

Size, 10 x 7. Price, $2.75.

No. 141. **Elephas primigenius,** Blum.

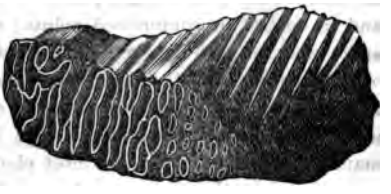
MOLAR. This unusually perfect and well preserved specimen shows well the distinctive structure of the mammoth grinder, and the inclination of the plane of the triturating surface to the vertical lines of the enamel-plates, due to the oblique growth of the tooth from the alveolar socket. The original weighs fourteen pounds, and belongs to the Ward Museum, in the University of Rochester.

Size, 11 x 8. Price, $2.75.

No. 142. **Elephas Americanus,** De Kay.

MOLAR. This Mammoth of the New World, similar to, if not identical with the *E. primigenius* of Europe and Asia, ranged from Canada to Georgia, Texas, and Mexico, on the South, and to Oregon and California on the West. It was evidently fitted for a warmer climate than the Old World species since the fossils are most abundant in the Mississippi valley. This grinder was found in the surface Alluvium at Homer, Cortland County, New York, and is in the Academy at Homer. Size, 12 x 6. Price, $2.25.

No. 143. **Elephas Americanus,** De Kay.



MOLAR. From the Pleistocene at St. Catherines, Canada West, and now in Burnet's Museum, Table Rock, Niagara. Size, 7 x 5. Price, $1.75.

No. 144. **Elephas primigenius,** Blum.

LEFT HUMERUS. This specimen, from the Pleistocene formation in the Department of Isére, France, is in the Museum of Natural History at Lyons.

Size, 3 ft. 4 in. x 1 ft. Price, $7.00.

No. 145. **Elephas primigenius**, Blum.

RIGHT TIBIA. From the same locality and Museum.

Size, 25 x 10. Price, $4.50.

No. 146. **Mastodon giganteus**, Cuv.

SKULL AND LOWER JAW. Mastodont remains were first discovered at Albany, N. Y., and described by Dr. Mather in the *Philosophical Transactions* for 1712. The first specimens seen in Europe were found thirty years after, by Longueil, on the edge of a marsh near the Ohio River, and hence the French called the unknown creature, "the animal of the Ohio." Bones have since been found as high as 70° N. But they mainly frequented a more temperate zone; and we have no evidence that any species was specially fitted like the Mammoth to brave the rigors of an arctic winter. Humboldt found a tooth near the volcano of Imbaburra, at an elevation of 7,200 feet. The remains occur chiefly in the United States, Europe, and India. Mastodons were the earliest of elephantoid mammals. They are distinguished from the Elephants by their less complex molars; flatter cranium; smaller development of the frontal air-cells, presenting a less intelligent character; more elongated body, but not much, if any, higher; and limbs proportionately shorter and stronger. The teeth differed less from those of the older tapiroid Pachyderms than do the grinders of the true Elephants. The surface, instead of being cleft into numerous thin plates, was divided into wedge-shaped transverse ridges, and the summit of these were subdivided into smaller cones, more or less resembling nipples, whence the name. When worn, the protuberances become truncated into a lozenge form. Bronn and Owen state that the Mastodon is characterized by lower incisors (tusks) and by molars which are replaced from back to front, excepting one or more milk-molars; while in the Elephant there are no inferior incisors, and *all* the molars are replaced in a horizontal direction. Falconer shows that these generic distinctions are neither absolute nor constant. He makes the Mastodons include all the elephantoid species which have the crowns of the molars comparatively simple and uniformly divided into two subequal divisions by a longitudinal cleft; the ridges limited to three or four in number, and invariably more or less concave across; the enamel thick (in some specimens three times as thick as in the Mammoth), and in conical or compressed points; and the valleys between the ridges deep and empty, or with but a sparing quantity of cement. The Elephants, on the other hand, include all the Proboscideans which have the crowns of the molars more complex, and usually wanting in a longitudinal line of division; the ridges more numerous and less definite, each being composed of a greater number of mammillary points, which are most elevated in the middle, rendering the ridges convex across; the processes of enamel thinner, higher, and more divided; and the deep narrow valleys entirely filled up with cement. The deciduous dental formula of the M. is: $i\ \frac{1}{1}$ or $\frac{1}{0}$, $c\ \frac{0}{0}$, $m\ \frac{3}{3}=7$ or 8; of the E. it is: $i\ \frac{1}{0}$, $c\ \frac{0}{0}$, $m\ \frac{3}{3}=7$. The persistent dental formula of the M. is: $i\ \frac{1}{1}$ or $\frac{1}{0}$, $c\ \frac{0}{0}$, $pm\ \frac{2}{2}$ or $\frac{0}{0}$, $m\frac{3}{3}=8-12$; of the E. it is: $i\ \frac{1}{0}$, $c\ \frac{0}{0}$, $pm\ \frac{2}{2}$ or $\frac{0}{0}$, $m\ \frac{3}{3}=7-11$.

The lower molars of the M. are narrower than the upper, and the grinding surface of the latter describe in their longitudinal direction a slight convexity, while the former have a corresponding concavity. In the upper molars the inner range of tubercles are most worn; in the lower ones, the outer range. By these marks a detached grinder may be referred to the jaw and ramus supporting it.

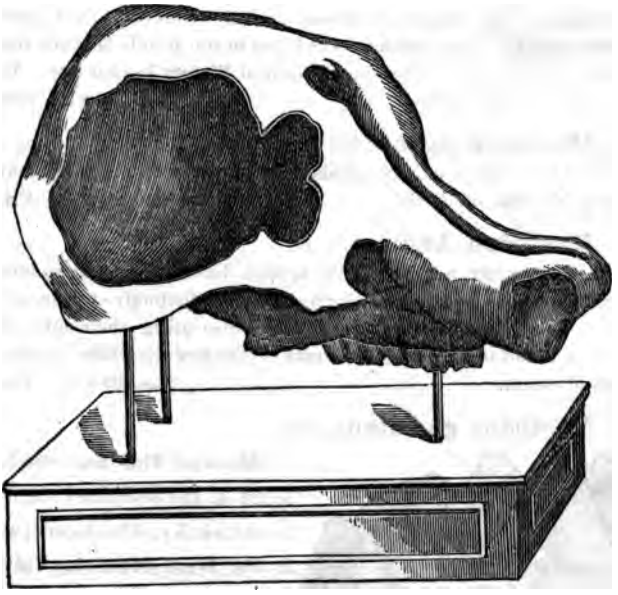
The *M. giganteus* (*M. Ohioticus* of Blum.) is the most common species in the United States. The transverse ridges of its grinders are in shape more like those of the *Dinotherium* than in any other Mastodon. The penultimate and antepenultimate grinders are three-ridged, making it a *Trilophodon* in Falconer's arrangement. The lower jaw has two tusks in the young of both sexes; these are soon shed in the female, but one of them (usually the right) is retained by the male. The upper tusks are retained in both sexes; they are elliptical, and are less obliquely curved than in the Elephant. This fossil head of a young animal was taken from a marsh (Pleistocene) near Newburg, N. Y., and is now in Dr. Warren's Museum, Boston. It contains two unworn molars in each ramus.

Size, 28 x 23. Price, with mountings, **$20.00.**

No. 147. **Mastodon giganteus,** Cuv.

LOWER JAW of No. 146. Size, 24 x 14. Price **$6.00.**

No. 148. **Mastodon giganteus,** Cuv.



SKULL. This, one of the largest elephantoid skulls that has ever been discovered, and known as the "Shawangunk Skull," was disinterred from a Post-Glacial fluviatile deposit in Orange County, N. Y.

Size, 3 ft. 9 in. x 2 ft. 8 in. Price, $30.00.

No. 149. **Mastodon giganteus,** Cuv.

LOWER JAW. This was found in St. Catherines, Canada West, and is preserved in Burnet's Museum, Table Rock, Niagara.

Size, 3 ft. 2 in. x 2 ft. 7 in. Price, $4.00.

No. 150. **Mastodon Borsoni,** Hays.

LOWER JAW. This species was founded on the supposed absence of the longitudinal cleft along the summit of the molars. It is a "Trilophodon." The specimen was found in the Upper Pliocene, Vialette, Department of Haute-Loire, France, and is in the Museum of Natural History at Lyons.

Size, 24 x 18. Price, $8.00.

No. 151. **Mastodon Arvernensis,** Croizet and Jobert.

LOWER JAW. This lower jaw of the Auvergne Mastodon was found in the Pleistocene sands of Montachita, Italy. It lacks both condyles, but shows the nascent dentition of the third molar teeth. The original is in the Museum of the University of Pisa. Size, 15 x 14. Price, $5.00.

No. 152. **Mastodon longirostris,** Kaup.

LOWER JAW, RIGHT RAMUS, FRAGMENT. This species is characterized by three narrow molars in each ramus, and especially by the prolongation of the lower jaw which carries a pair of tusks only slightly deflected from the line of the grinders. It is distinguished from *M. angustidens*, Cuv., by a more complex last molar tooth. It is a "Tetralophodon," since the first and second true molars have four ridges. The remains are almost entirely confined to the Upper Miocene sands of Eppelsheim; this specimen was found in the Middle Miocene near Lyons, France, and belongs to the Museum of Natural History in that city. It contains the deep sockets for the tusks. Size, 14 x 8. Price, $3,00.

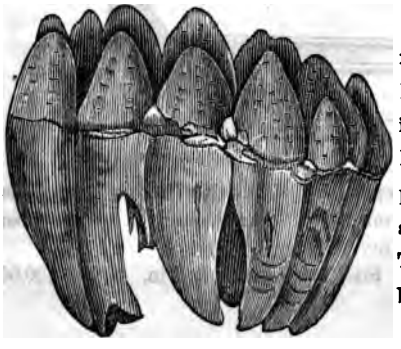
No. 153. **Mastodon giganteus,** Cuv.

LOWER JAW, RIGHT RAMUS. This fragment was found in Missouri, and is in the Royal Museum of Berlin. Size, 28 x 14. Price, $4.00.

No. 154. **Mastodon Andium,** Cuv.

LOWER JAW, LEFT RAMUS. This species has four-ridged molars (Tetralophodon), and one or two large inferior incisors. A distinctive feature of its tusks is a strip of enamel two inches broad, lengthwise along their outer side. The specimen was found in the Miocene strata of the Sewalik Hills, India, and is in the British Museum. Size, 30 x 14. Price, $5.00.

No. 155. **Mastodon giganteus,** Cuv.



MOLAR. This fine specimen was found at the celebrated locality of Big Bone Lick, Ky. (Pleistocene), and is now in the Ward Museum, University of Rochester. It shows in the unusual perfection the cusps, the alveolar line, and the long, curved fangs of the tooth. The enamel is little worn, and is as bright as in the teeth of living animals.

Size, 7 x 6. Price, $3.06.

No. 156. **Mastodon affinis.**

FIFTH UPPER MOLAR, RIGHT RAMUS. This was found in the Lower Pliocence, Department of Isére, France, and is in the Museum at Lyons. Price, $1.00.

No. 157. **Mastodon dissimilis.**

FIFTH UPPER MOLAR, LEFT RAMUS. From the Upper Pliocene in the Department of Haute-Saône, France, and now in the Museum at Lyons. Price, $1.00.

No. 158. **Mastodon dissimilis.**

LAST UPPER MOLAR, RIGHT RAMUS. This was discovered in 1827, in the Upper Pliocene, near Montpelier, France, and is in the Museum of Lyons. Price, $1.75.

No. 159. **Mastodon longirostris,** Kaup.

LAST UPPER MOLAR, RIGHT RAMUS. From the Middle Miocene, near Lyons, France, and is in the Museum of Natural History of that city. Size, 7 x 7. Price, $1.50.

No. 160. **Mastodon dissimilis.**

LAST UPPER MOLAR, LEFT RAMUS. From the Upper Pliocene, near Lyons, and now in the Museum of that city, Size, 7 x 3. Price, $1.50.

No. 161. **Mastodon insignis.**

FOURTH LOWER MOLAR, LEFT RAMUS. From the Lower Pliocene, Department of Ain, France, and same Museum as above. Price, $0.60.

No. 162. **Mastodon insignis.**

FIFTH LOWER MOLAR, LEFT RAMUS. Same locality and Museum as preceding. Price, $1.00.

No. 163. **Mastodon dissimilis.**

LAST LOWER MOLAR, RIGHT RAMUS. From the Lower Pliocene, near Tourney, France, and now in the Museum at Lyons. Size, 9 x 3. Price, $1.25.

No. 164. **Mastodon giganteus,** Cuv.

MOLAR. The original, from the Diluvium of St. Catharines, Canada West, is in Burnet's Museum, Table Rock, Niagara. Size, 8 x 7. Price, $2.00.

No. 165. **Mastodon elephantoides,** Cleft.

MOLAR. The intermediate group of Proboscideans, from which the other

species diverge through their dental characters, on the one side into Mastodons. and on the other into the typical Elephants, is designated by Clift, *M. Elephantoides.* Others, as Owen, call them transitional Mastodons; while Falconer regards them as more properly belonging to the Elephants, and corresponding to his sub-genus "Stegodon." The ridges of the molars range from six to eight, and are more elevated than in the true Mastodons. Thus far, this extinct group has been found only in the Indian Tertiaries. This tooth, from the Miocene in Ava, belongs to the Garden of Plants. Size, 6 x 4. Price, $1.25.

No. 166. **Mastodon giganteus,** Cuv.

MILK TOOTH. This specimen is from the Pleistocene blue clay at Big Bone Lick, Kentucky, and is in the Museum of the Academy of Natural Sciences, Philadelphia. Size, 6 x 3. Price, $1.25.

No. 167. **Mastodon ——.**

MILK TOOTH. Locality unknown. Price, $0.30.

No. 168. **Mastodon giganteus,** Cuv.

TUSK. The original, discovered in the Diluvium at St. Catherines, Canada West, is preserved in Burnet's Museum, Table Rock, Niagara.—Size, 8 ft. 10 in. x 7 in. Price, with mountings and pedestal, $10.00.

No. 169. **Mastodon longirostris,** Kaup.

TUSK OF LOWER JAW. From the Middle Miocene, near Lyons, France, and belongs to the Museum of Natural History in that city.

Size, 20 x 3. Price, $2.00.

No. 170. **Mastodon giganteus,** Cuv.

ATLAS. This specimen, from a Pleistocene deposit in North America, is in the Cabinet of William's College, Mass. Size, 18 x 9. Price, $2.25.

No. 171. **Mastodon giganteus,** Cuv.

DENTATUS. The original, from St. Catherines, Canada West (Pleistocene), is in Burnet's Museum, Table Rock, Niagara. Size, 10 x 8. Price, $1.75.

No. 172. **Mastodon giganteus,** Cuv.

FIRST DORSAL VERTEBRA. The original, from a Pleistocene formation in the State of New York, is in the Cabinet of William's College, Mass.

Size, 18 x 10. Price, $2.00.

No. 173. **Mastodon Borsoni,** Hays.

RIGHT FEMUR. From the Upper Pliocene, Department of Haute-Saône, France. The original is in the Museum of Natural History at Lyons.

Size, 4 ft. 6 in. x 1 ft. 5 in. Price, $8.00.

No. 174. **Toxodon augustideus,** Owen.

LOWER JAW. The Toxodon, although represented only by the skull and a few other fragments, has, from the earliest period of its discovery, greatly attracted the interest and attention of Naturalists. The dimensions of its skull show that it rivalled the largest quadrupeds in size, while its general proportions and peculiarities of form prove clearly that this extinct genus differed essentially from any other animal hitherto described. The T. appears to have united certain features allying it to both the Rodents, Pachyderms and Cetaceans. It had two incisors in each side of the upper jaw, and these presented the very anomalous feature of curving *inwards* from either side so as to form a sort of arch below the palate. It is from this curving of the teeth that the generic name has been taken. The T. was an herbivorous animal, and very probably fed upon the plants in rivers like the Dugong or the Manatee. This specimen was found in the Pampean formation (Pleistocene) of Buenos Ayres, and is in the British Museum.

Size, 24 x 11. Price, $6.00.

ORDER 8 — CETACEA.

The members of this Order, formed for life in the ocean, have, in many respects, the external appearance of Fishes. By some authors they are called "Mutilates," because their hind limbs appear to have been amputated. The clavicle is wanting, and the pelvis is scarcely represented by two small rudimentary bones. The true *Whales* are characterized by the extremely long bones of the face, and by the nasal bones forming the very highest part of the skull. Teeth are entirely wanting in the adult. The caudal vertebræ differ from those of Fishes in retaining the transverse processes. The true *Dolphin* has forty-seven sharp, conical, crooked teeth in each ramus. The *Sirenia* are vegetable feeders, sometimes crawling on shore to feed. Both jaws are armed with incisors, and molars with flat-ridged crowns. The cervical vertebræ are not anchylosed as in the Whale. There is much in the organization of the Sirenians which indicates an affinity to the Pachyderms.

The earliest Cetacean remains discovered are two species of *Priscodelphinus* (Leidy) from the New Jersey cretaceous, and the

Palæocetus from the Upper Greensand of Ely, Eng. With these exceptions, the Order (according to our present knowledge) is confined to the Tertiary and Recent Periods. The most numerous fossil relics (teeth and ear-bones) have been found in the Red Crag, but evidently washed out of Eocene strata. In the Miocene Period, the Dugongs and Manatees were abundant and more widely distributed than now. Their fossil bones have the solid structure of those of living herbivorous mutilates.

No. 175. **Halitherium Schinzi.**

SKULL, FEMUR, AND TOOTH. This herbivorous animal, related to the Dugong, lived by the sea-shore and the mouths of rivers. Remains have been found in every deposit above the Calcaire Grossier (Middle Eocene). These specimens were discovered in the Miocene at Flonheim, Rhine Valley. Size, 8 x 8. Price, $5.00.

No. 176. **Zeuglodon cetoides,** Owen.

TWO TEETH. This carnivorous whale typified a distinct family intermediate between Cetacea proper and Sirenia. Its teeth were first described by Scilla in 1747; in 1836 by Harlan under the names of *Basilosaurus* and *Squalodon;* and in 1839 by Owen, who first determined the mammalian and cetacean nature of the animal. When full grown, it was probably seventy feet in length. The skull is long and narrow; the nostril single and looking upward. The jaws are armed with teeth of two kinds, set wide apart: the anterior have subcompressed, conical, slightly recurved, sharp, pointed crowns, and are implanted by a single root; the posterior are larger with more compressed and longitudinally extended crowns conical, but with a more obtuse point, and with both front and hind borders strongly notched or serrated. The crown is contracted from side to side in the middle of its base, so as to give its transverse section an hour-glass form. The generic name refers to this structure. The root of the posterior teeth has two fangs. The mode of succession conforms to the general mammalian type more than any existing carnivorous Cetacean; i. e. the decid-

nous tooth is displaced and succeeded vertically by a second molar. These fossil teeth, one anterior, the other posterior, were discovered in a marl deposit of the "Jackson epoch" (Middle Eocene) in Claiborne, Alabama, and are now in the Anatomical Museum of Berlin. Size, 6 x 4. Price, $1.00.

No. 177. **Zeuglodon hydrarchus,** Carus.

SKULL. The distinctive feature of this species is this, that while in the *Z. cetoïdes* there is in the upper jaw a conical tooth having two roots which may pass for a canine or a premolar, in the *Z. hydrarchus* there are two such abnormal canines. So that its dental formula is: $i\ \frac{3}{4}\ c\ ?\ \frac{2}{6}\ m\ \frac{5}{5}=19$. This skull was found at the same locality as the preceding, and belongs to the Tylerian Museum at Haarlem. Size, 32 x 13. Price, $7.00.

No. 178. **Rhizoprion Schinzi.**

HEAD. This Cetacean—somewhat allied in form to the modern Porpoise—is from the Middle Tertiary beds of Central France, and is preserved in the Museum of Natural History of Lyons.

Size, 26 x 10. Price, $10.00.

No. 179. **Balænodon gibbosus.** Owen.

CETOTOLITES, two specimens. These fossil tympanic bones belong to a large, extinct Whale, which, probably like some contemporary quadrupeds, retained fully developed characters which are embryonic and transitory in existing Cetaceans. They were found in the Red Crag (Pliocene) of Suffolk, England; but as they are water-worn and rolled, and were doubtless washed out of previous strata. The original specimens belong to the Ward Museum in the University of Rochester. Price, $1.00.

No. 180. **Cœtus Emmonsi,** Leidy.

TOOTH. This remarkable dental form, having a resemblance to the canine of the Hippopotamus, was found in the Older Miocene of White River, Upper Missouri region. Size, 9 x 4. Price, $1.25.

ORDER 9 — MARSUPIALIA.

The Marsupials possess a peculiar feature which places them lowest in the Mammalian series. This feature is the premature production of their young, which are matured in a pouch, supported by two peculiar

bones attached to the pubis. These characteristic bones are found in all Marsupials—male as well as female, except the *Thylacinus*. The Order presents a remarkable diversity of structure, there being herbivorous, carnivorous and insectivorous species, and in fact representatives of many of the higher Orders of Mammals. In the herbivorous species, the canines are usually wanting. Excepting one American and one Malayan genus, Marsupials are now confined to Australia, Tasmania and New Guinea.

Marsupials were the first of Mammals—the *Microlestes* having been discovered between the Lias and Keuper Sandstone near Stuttgardt, while the *Dromatherium* was found in the Triassic (or Liassic) coal-field of North Carolina.

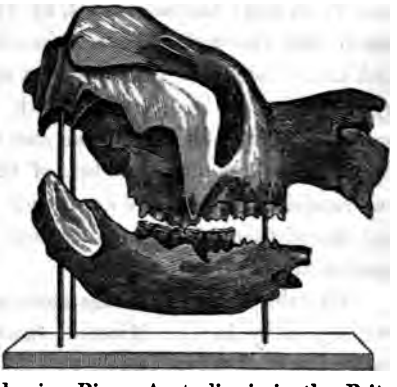
No. 181. **Diprotodon Australis**, Owen.

Skull and Lower Jaw. This gigantic Kangaroo—nearly equalling the Hippopotamus in size—was discovered in the Pleistocene beds at Darling Downs, Australia, and was therefore contemporary with the great Sloths of South America. Like the Megatherium, while retaining the dental formula of its living homologue, it shows remarkable modifications of its limbs. The hind limbs were shorter and stronger, and the front limbs were longer and stronger than those of living Kangaroos; yet the ulna and radius were so articulated as to give the fore-

paw the rotatory action. The dental formula was $i \frac{3}{1}-\frac{3}{1}$, $c \frac{0}{0}$, $p \frac{1}{1}-\frac{1}{1}$, $m \frac{4}{4}-\frac{4}{4}=28$. The front upper incisors were very large and scalpriform, as in the Wombat; the premolars were soon shed; and the molars had two ridges disposed as in the Tapir and Kangaroo, but more compressed and prominent. The D., in this last respect, approached the Pachyderms, furnishing, says Pictet, a new proof of par-

allelism existing between the monodelphs and didelphs. The original of this fine specimen is in the British Museum. A part of the right lower ramus is wanting.
Size, 3 ft. 5 in. x 1 ft. 10 in. Price, mounted. $40.00.

No. 182. **Nototherium Mitchelli,** Owen.



SKULL AND LOWER JAW. This quadruped, which probably rivalled the Rhinoceros in size, manifests pachydermal modifications of the marsupial type. It differs from the Diprotodon in the polished surface of the enamel as contrasted with the punctate surface of the teeth of the latter, by the obliquity of the molar ridges, and by procumbent incisors of less relative size. There were three molars and two premolars in each ramus. From the great width of the zygomatic arches, it was formerly called *Zygomaturus*. This specimen, discovered in the alluvial deposits near the Condamine River, Australia, is in the British Museum. Size, 20 x 18. Price, mounted, $12.00.

No. 183. **Thylacoleo carnifex,** Owen.

LOWER JAW, RIGHT RAMUS. This marsupial carnivore was about the size of the Lion. The fossil was found in the Pleistocene formation of Australia, and is preserved in the British Museum. Price, $0.60.

CLASS II — AVES.

The earliest evidences of Birds are footprints on the tidal shore of the Liassic Sea. The fossil bones are much more rare than those of other Vertebrates, excepting, perhaps, in the favored locality of New Zealand. "The powers of flight possessed by most Birds (says Lyell) would ensure them against perishing by numerous casualties to which quadrupeds are exposed during floods." The length of time, also, during which the carcase of a Bird may float, exposes it the more to be devoured, and also to the wider dispersion of its remains. The greatest part of ornithic remains yet found are those of land Birds.

Certain cylindrical bones from the Stonesfield Oolite, Wealden, and Chalk have turned out under the critical eye of Owen to be Pterodactylian. The oldest authentic ornitholites are the relics of a small Vulture (*Lithornis vulturinus*) found in the Eocene clay of the Isle of

Sheppey. "Comparisons of the ornitholites of the Eocene Tertiaries (says Owen) show that the following ordinal modifications of this class of Birds were at that period represented: the *raptorial*, by species of the size of our ospreys, buzzards and smaller falcons, and most probably also by an owl; the *insessorial*, by species seemingly allied to the nut-hatch and the lark; the *scansorial*, by species as large as the cuckoo and king-fisher; the *rasorial*, by a species of small quail; the *cursorial*, by a species as large as, but with thicker legs than, an ostrich; the *grallatorial*, by a curlew of the size of the ibis, and by species allied to Scolopax, Tringa and Pelidna, of the size of our woodcock, lapwings and sanderlings; and the *natatorial*, by species allied to the cormorant, but one of them of larger size, though less than the pelican; also, by a species akin to the Divers."

Ornithic remains become more abundant as we approach the present era, especially in the Miocene strata, so richly developed in France. Indications of every Order, except the great *Cursores*, have been observed in that formation,—those of Waders being most numerous.

The Pliocene marls at Monte Bolca furnish impressions of feathers, and the Pleistocene clay of England has yielded a fossil humerus resembling that of the wild goose. But most of the ornitholites of the recent Tertiary are confined to bone-caverns. They belong to Birds resembling the falcon, wood-pigeon, lark, thrush and teal.

The most extraordinary additions to the palæontology of this Class have been obtained from New Zealand—an island remarkable for possessing but one indigenous land-mammal, and but a few diminutive reptiles. Colossal Birds, ranging from three to ten feet in height, akin to the Ostrich but tridactyle and tetradactyle, have left remains in the recent Alluvium.

No. 184. **Didus ineptus.**

HEAD. The Dodo has been extirpated and become one of the extinct fossil forms, within the last 150 years. At the beginning of the seventeenth century, it abounded in Mauritius and adjacent islands. One was exhibited alive in London in 1638, as a great curiosity. Now the only known relics that remain are the head and foot of an individual in the Ashmolean Museum, Oxford, England, the leg of another in the British Museum, and a skull in the Royal Museum at Copenhagen. It was an aberrant form of the Pigeon family, as determined by the researches of

Reinhardt, Strickland and Melville. "As the Greenland Whale may be called a permanent suckling, the teeth never penetrating the gums, though in youth they are distinctly traceable in the dental groove of the jaws; as the Proteus is a permanent tadpole, the Dodo was a permanent nestling, clothed with down instead of feathers, and with the wings and tail so short and feeble, as to be utterly unsubservient for flight. We cannot form a better idea of it than by imagining a young Duck or Gosling enlarged to the dimensions of a Swan." It was at first believed to belong to the Ostrich tribe, and Professor Owen placed it among the Vultures. It had a strong, predaceous bill hooked at the tip, and the face was covered with naked skin. The nearest living approach to the D. is the *Didunculus* of the Navigator's Islands. Size, 9 x 5. Price, $1.75.

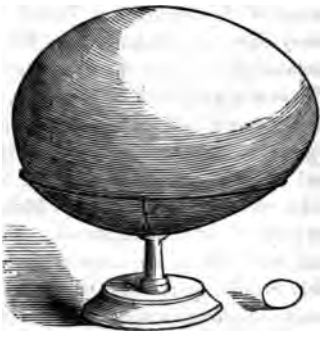
No. 185. **Didus ineptus.**

RIGHT FOOT. From the same locality and Museum.

Size, 9 x 3. Price, $1.75.

No. 186. **Æpiornis maximus,** St. Hilaire.

METATARSALS AND TWO EGGS. These remains indicate a three-toed cursorial Bird, which must have stood twelve feet high. They were discovered in 1850, in Madagascar, in alluvial banks of streams, and belong to the Garden of Plants.—Size of the metatarsals, 8 x 5; of the eggs, 13 x 9 and 12 x 10. One of these eggs is equal to 148 hen's eggs, and will hold two gallons of water. Price of the metatarsals and one egg with mounting, $4.50; of the metatarsals and two eggs with mountings, $8.00.



No. 187. **Palapteryx ingens,** Owen.

RIGHT METATARSAL. This gigantic struthious Bird, now extinct, was, so called from its resemblance to the living *Apteryx* of New Zealand, although it is more nearly related to the *Emeu*. According to the calculations of Professor Owen, it stood nine feet high. It is readily distinguished from the *Dinornis* (with which it was at first confounded) by being tetradactyle, as shown by a posterior articular depression for connexion with a hind-toe. The *Dinornis* is three-toed, and has besides an enormously developed occiput. The P. is also characterized by a remarkable development of the organs of smell. From the great width and solidity of the metatarsal, and the form and corresponding size and strength of the phalangeals, it is inferred that the feet of the P. were powerful instruments for scratching, digging and uprooting vegetable substances, which, judging from the structure of the cranium and beak, constituted the chief food of the colossal biped. The P. and *Dinornis* rivalled in size the *Brontozoum* of the ancient Connecticut Valley. This relic of the P. was discovered in the menaccanite-sand deposit (Pleistocene) at Waingongoro, New Zealand, and is in the British Museum.

Size, 18 x 6. Price, $2.00.

No. 188. **Palapteryx ingens,** Owen.

RIGHT FOOT. Size, 21 x 16. Price, $3.50.

Ornithichnites.

☞ The following celebrated Foot-prints, discovered and described by the late Dr. E. HITCHCOCK, of Amherst, Mass., are popularly known as *Bird-tracks*, and are therefore entered at this place. Geologists, however, are not assured of their ornithic origin; many of them are probably reptilian.

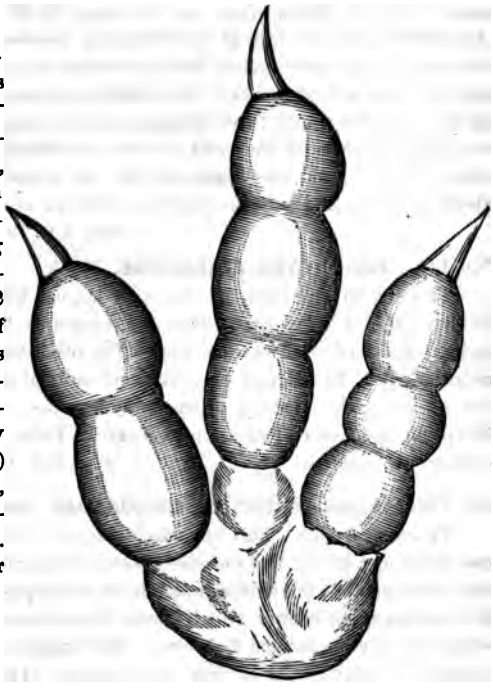
No. 189. **Brontozoum giganteum**, Hitchcock.

FOUR TRACKS, on slab. These enormous bird-like foot-prints belong to a bipedal animal that lived by the shore of an estuary which deposited the sandstones of the Connecticut Valley. Each track measures fifteen inches in length; every claw and phalange has left its mark, while the trifid termination of the metatarsal bone left three marks more—fifteen in all—the true ornithic number. The stride was thirty-eight inches, so that the same limb was carried out each step nearly seven feet. The animal went forward nearly on a straight line, so that its legs must have been very long. Hitchcock estimates that it was twelve feet high, and weighed from four hundred to eight hundred pounds. (The Ostrich stands between seven and eight feet high, weighs sometimes one hundred pounds, and its stride is twenty-six inches.) The substratum bent under the enormous weight, and the depth of the impression exceeds two inches. The Brontozoa were probably Scansores like the Ostrich and Dinornis. From the fact that parallel rows of tracks are found a short distance from one another, we infer that they were accustomed to frequent in flocks the shores of the sea, to wade in its shallows in quest of mail-covered fishes of the ancient type and long extinct molluscs. These feathered giants flourished in the days of the Ichthyosaurus, or at least between the Coal and Jurassic periods. The age of the red sandstone, in which the tracks occur, has not been precisely determined, but it is supposed to be Liassic. This specimen was found near Turner's Falls, Mass., and belongs to the Appleton Cabinet of Amherst College. Size, 11 ft. 8 in. x 2 ft. Price, $16.00.

No. 190. **Brontozoum giganteum**, Hitch.

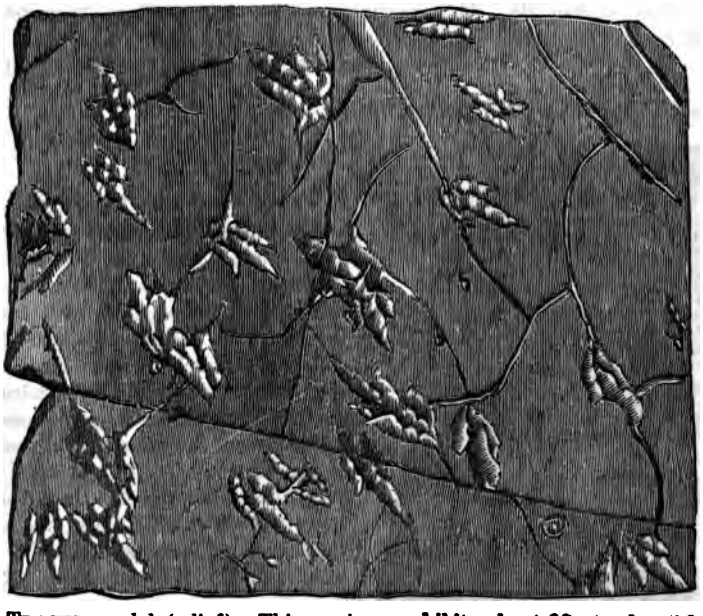
TWO TRACKS, on slab. Stride, nearly four feet. From the same locality and Museum as the preceding. Size, 5 ft. 6 in. x 15 in. Price, $6.00.

No. 191. **Brontozoum giganteum,** Hitch.



SINGLE TRACK (impression and relief), on slab. This is the largest tridactyle impression ever discovered. It measures eighteen inches in length, embracing an area of thirteen inches square within its outlines, and is capable of holding two quarts of water. The middle and outer toes measure 12 and a half inches,—length of claw, 1.75 inch. The print is remarkably well defined, having all the fidelity of a plaster-cast. It was discovered by Dexter Marsh in the Liassic (?) Sandstone at Northampton, Mass., and belongs to the Boston Society of Natural History. Size, 20 x 15. Price of either impression or relief, $4.00.

No. 192. **Brontozoum giganteum,** Hitch.



TRACKS, on slab (relief). This specimen exhibits about fifty tracks with the

phalangeal impressions and claws exceedingly distinct. The smaller tracks were made by the *B. Sillimanium*, and the larger by *B. exsertum*, Hk. The length of the middle and outer toes of the former is between four and five inches; of the foot about six inches; and of the step twenty-three inches. Width of the trackway, four and a half inches. The middle and outer toes of the latter measure six inches; the foot nearly three inches; and the step thirty inches. The slab also contains the crooked trackway of the *Cunicularius retrahens*, Hk., and mud-veins. The original was discovered in the micaceous sandstone (Lias ?) at Middletown, Conn., and is in the Appleton Cabinet at Amherst.

Size, 4 ft. 10 in. x 3 ft. 1 in. Price, $10.00.

No. 193. **Amblonyx giganteus**, Hitch.

TRACKS, on slab (relief). The two largest foot-prints in this specimen are those of the *A. giganteus*. The foot measures 11.25 inches, and the step 32 inches; width of trackway one foot. The other tracks belong to the *Brontozoum validum*, Hk. The step of this tridactyle animal is 33 inches in length, and the foot about 8 inches; width of trackway 6 inches. This slab was found by Dexter Marsh in the Lias (?) formation at Turner's Falls, Mass., and is in the Appleton Cabinet at Amherst. Size, 8 ft. 1 in. x 4 ft. 4 in. Price, $20.00.

No. 194. **Gigantitherium caudatum**, Hitch.

TRACKS on slab. This "ornithoid Lizard or Batrachian" had three clawed toes pointing forward, and one short posterior one; the tracks are nearly in a right line, showing that the animal was bipedal and long-legged; and there is the trace of a tail dragging behind, which passes through the middle of the tracks, except when the animal changed its course. The length of the foot from the tip of the middle toe to the end of the heel is 17.5 inches. On the same slab are also tracks of the "narrow-toed Bird," *Tridentipes uncus*, Hk., and a pentadactylous Tortoise, *Chelonoides incedens*, Hk. This specimen was found in the Lias (?) sandstone, near Turner's Falls, Mass., and is now in the Appleton Cabinet at Amherst.

Size, 8 ft. 8 in. x 1 ft. 11 in. Price, $10.00.

No. 195. **Anomœpus major**, Hitch.

TRACKS on slab. This singular animal had tridactyle hind-feet with clawed toes, heels, and phalanges of a Bird; but the fore-feet (not represented on this slab) had five toes, corresponding with those of the Kangaroo. From a fifth, heart-shaped, impression behind, it is inferred that the "ornithoid, marsupialoid" quadruped (as Dr. Hitchcock defines it), possessed a stout caudal appendage. The length of the hind-foot is 16½ inches. The original was discovered in the red sandstone (Lias ?) at Gill., Mass., and is in the Appleton Cabinet at Amherst.

Size, 2 ft. 3 in. x 19 in. Price, $5.00.

No. 196. **Polemarchus gigas**, Hk.

TRACK, on slab. This animal, a Lizard according to Hitchcock, has given no evidence of having had more than two feet. These are plantigrade, or even calcigrade, the heel sinking deeper than the toes. There are three long, slender toes, directed forward, and a fourth, like a spur, turned inward. The length of the foot is 14.8 inches, and the width of the heel, 3.9 inches. This print was found at Chicopee Falls, Mass., in the Lias (?) sandstone, and belongs to Amherst College.
Size, 19 x 11. Price, $2.75.

No. 197. **Plectropterna minitans**, Hk.

TRACK, on slab. This animal was probably quadrupedal and lacertilian. This specimen is the track of a hind-foot, which bears four slender toes, three directed forward. It was found in the Lias (?) of Wethersfield, Conn., and is in the Museum of Amherst College. Size, 4 x 7. Price, $1.00.

No. 198. **Plectropterna ——**, Hk.

TRACK, on slab. From the same locality and Museum.
Size, 4 x 7. Price, $1.00.

No. 199. **Argozoum ——**, Hk.

TRACK, on slab. This "narrow-toed Bird" was tridactyle, the toes being curved, and digitigrade. The print was found in the Lias (?) of Chicopee Falls, Mass., and is in the Museum of Amherst College. Size, 11 x 7. Price, $1.50.

CLASS III — REPTILIA,

The history of fossil Reptiles exhibits a degradation in type. The genera first created were of the most highly organized types; while those which maintain a persistent form of some of the embryonic stages do not appear until the Tertiary Period. Reptilian life culminated during the deposition of the Wealden. The first osseous remains are those of the Carboniferous *Archegosaurus*. (The *Stagnolepis*, formerly ranged by Agassiz among the Fishes, but decided by Huxley to be a Crocodilian, the *Telerpeton* and *Hyperodapedon* found at Elgin, are now considered Triassic, instead of Devonian.) All the species of that Period were Amphibian. If the Labyrinthodonts (as Owen thinks) are Saurians arrested in their development on the level of the Batrachians, we then have proof that representatives of a permanent larvæ condition existed among the loricated Reptiles of the ancient world, in like manner as the Sirens do among the recent Batrachians.

Order 1 — Sauria.

The Saurians are distinguished by an elongate, rounded body densely covered with scales or plates; an elongate, tapering, usually scaly tail; four limbs (occasionally rudimentary); distinct ribs and sternum; one occipital condyle; and a mouth not dilatable.

The *Deinosaurians*—the highest and most terrible of Reptiles—are distinguished by four well-developed, unguiculate limbs, a medullary cavity in the bones of the extremity, five anchylosed sacral vertebræ, a twofold articulation of the ribs, broad coracoids, and long slender clavicles. They first appear in the upper member of the Lower Lias, and are now extinct.

The *Enaliosaurians* were those marine, air breathing, carnivorous Lizards that swarmed in such prodigious numbers during the Secondary epochs. In many respects they were intermediate between the Chelonia and Crocodilia; but the skin was probably naked. The skeleton is distinguished by the numerous biconcave vertebræ, a single occipital condyle, the position of the nostrils at or near the summit of the head, large teeth set in a groove or in sockets, and the many short, flat finger-bones. The group began in the Muschelkalk.

The *Pterosaurians*, or "Pterodactyles," are among the strangest creatures brought to light by Geology. They had the claws and teeth of a Reptile; the body and tail of a Mammal; beak, hollow bones and keeled sternum of a Bird; and a development of the forelimbs for wings like those of the Bat. They furnish the first example of the procoelian type of vertebræ. The teeth are implanted in distinct sockets. The oldest Pterodactyles are from the Lower Lias; the largest occur in the Upper Greensand; but the best defined and most numerous specimens come from the Middle Oolite.

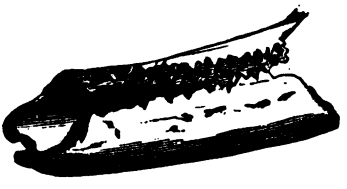
The *Crocodiles* are covered with a cuirass of square plates placed in longitudinal lines; the jaws are united into a solid mass; the premaxillary is double; the teeth are set in sockets in a single row; the vertebræ of Cretaceous, Tertiary and living species, are concavo-convex, of all others, either doubly flat, doubly concave or convexo-concave. In extinct species there are two nasal apertures; in recent forms, only one. Crocodiles have existed since the Lias Period.

The *True Lizards* have scales, one premaxillary, lower jaws united by a suture, teeth set in a groove (in certain extinct forms, in sockets), vertebræ concavo-convex, skull projecting in a ridge over the eyes, and two external nostrils. The earliest representation of the true lacertian type occurs in the Upper Oolite. But the Thecodont Reptiles, which agree in many respects with the amphicœlian Crocodiles, but combine

a dinosaurian femur with lacertian teeth, and are usually reckoned among the "Lacertilia," are found as low as the Trias. The "Anomedontia" (as the Rhynchosaurus) also belong to this group, and are Triassic. They have generally no teeth or only a pair of tusks, biconcave vertebræ, a single condyle, long curved trunk ribs, a complete zygomatic arch, and ambulatory limbs.

Dinosaurians.

No. 200. **Iguanodon Mantelli,** Meyer.



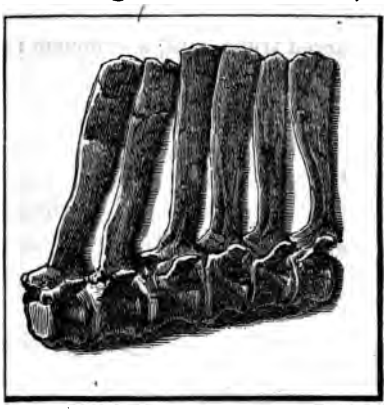
LOWER JAW. This great Dinosaurian was brought to light by Dr. Mantell in 1834. It was an oviparous, herbivorous, terrestrial quadruped, "a crocodile-lizard of the dry land." It occupied in the Reptilian Age the same relative station in the scale of being, and fulfilled the same general purposes in the economy of nature, as the Mastodons, Mammoths, and Megatherioids of the Pleistocene Period, and the existing gigantic Pachyderms. Fragments of coniferous trees, arborescent ferns and cycadeous plants have been found with its remains, showing the nature of its food. Professor Owen estimates the length of the head at three feet, of the trunk at twelve feet, and of the tail at thirteen feet. The I. had large hollow limb-bones and unguiculate feet—the hind pair, at least, having only three well-developed toes. The vertebræ, subconvex anteriorly in the neck but along the trunk subconcave on both surfaces, were articulated by a ligamentous substance as in Mammals. The dorsals are distinguished by their lofty and expanded neural arches; the sacrals by their unusual number (six) and complexity; and the caudals by neural spines of great height. The teeth differ in structure from those of every known Reptile. They are characterized by the prismatic, slightly curved form of the crown, the presence of from two to four longitudinal ridges on the enamelled face, and the serrated margins and summit. The teeth of the upper jaw are curved in the opposite direction to those of the lower, and have the convexity external. None of the teeth are fixed in distinct sockets, but are soldered by one side of the fang to the internal surface of the jaw. The cranium has not yet been discovered. This almost perfect specimen of the lower jaw is interesting, showing as it does that in the small extent of the symphysis the *Iguanodon* resembles the Lizards, and differs from the Crocodiles, while in the position of the symphysis and its sloping edentulous character the *Iguanodon* differs from all modern Reptiles. It was found in the Wealden strata, Sussex, England, and belongs to the British Museum. Size, 20 x 11. Price, $6.00.

No. 201. **Iguanodon Mantelli,** Meyer.

LOWER JAW, LEFT RAMUS (young). This fragment was found in the Tilgate Forest (Wealden), England, and is in the British Museum. Mantell ascribes it to the *Regnosaurus Northamptoni*, a small lacertian Reptile allied to the *Iguanodon;*

Owen refers it to the *Hylæosaurus*. It was first described (*Philosophical Transactions*, 1841) as belonging to the *Iguanodon Mantelli*. Price, $1.00.

No. 202. **Iguanodon Mantelli**, Meyer.



SIX CAUDAL VERTEBRÆ, on slab. This matchless specimen, from the Mantellian Collection in the British Museum, shows the vertebræ in natural sequence and relative position, with their processes from thirteen to fifteen and a half inches high. The height of these processs shows the great vertical breadth of the tail of the Iguanodon; a feature which argues aquatic habits for the animal. This fossil was found in the Wealden grit at Tilgate Forest, England.

Size, 2 ft. 6 in. x 22 in. Price, $7.00.

No. 203. **Iguanodon Mantelli**, Meyer.

LEFT FEMUR. This is the largest and most perfect Iguanodon femur in the British Museum. It is remarkable from the combination of mammalian characters which it presents in its well marked head and neck, three trochanters, large rounded condyles, and medullary cavity. The shaft is subquadrangular, and measures twenty-two inches round. It was dug up from the Wealden Clay in Sussex, England. Size, 3 ft. 9 in. x 14 in. Price, $7.00.

No. 204. **Iguanodon Mantelli**, Meyer.

TWO CLAWS, HORN (?) AND TOOTH. The ungual bones are broad, flat and blunt. The third specimen, commonly considered after Mantell as the bony core of a median frontal horn, has been lowered by Owen from the forehead to the end of one of the toes! The tooth exhibits the peculiar dental characters of the Iguanodon. These specimens are from the same locality and Museum as the preceding. Price, $2.00.

No. 205. **Iguanodon Mantelli**, Meyer.

TRACK, in relief. This huge tridactyle print, referred by early observers to gigantic birds, has been considered to have been made by the thick-footed, three-toed Iguanodon. This idea is supported by the occurrence of numerous bones of the Iguanodon and other Dinosaurians in the Wealden deposits, where this was found. The marks of the three toes are well defined, the middle one measuring eleven inches in total length. A cup-shaped impression behind is supposed to represent the heel of the Reptile. This track, found in Wealden strata at Hastings, Eng., is in the Museum of the Geological Society of London.

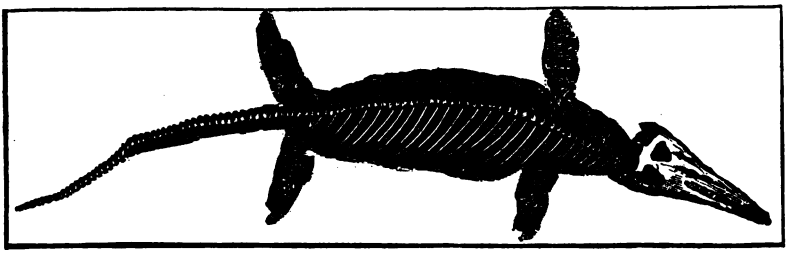
Size, 3 ft. 7 in. x 1 ft. 10 in. Price, $6.50.

No. 206. **Iguanodon Mantelli**, Meyer.

TRACK, in high relief. From the same locality and Museum as the preceding. Size, 18 x 17. Price, $4.00.

Enaliosaurians.

No. 207. **Ichthyosaurus intermedius,** Conyb.



SKELETON, on slab. The Ichthyosauri are distinguished by a long head, short neck, large abdomen, polydactylous paddles, and a powerful finned tail. They have a single occipital condyle, one vomer, thin biconcave, ossified vertebræ, stout, conical, striated teeth implanted in a common alveolar groove, a large eye with a compound circle of overlapping sclerotic plates. The general form of the cranium resembles that of the Dolphin; the essential difference lies in the small size of the cerebral cavity, in the vast depth and breadth of the zygomas, and in the distinctness of the cranial bones. The mouth is very wide, and the jaws are armed with numerous teeth indicative of a predatory and carnivorous nature. The lower jaw is made up of twelve pieces. The scapular arch resembles that of the Ornithorhynchus, and gave great strength to the chest and paddles, permitting the animal to crawl on the sea-shore,—a thing impossible to the mammalian sea-monsters. The vertebræ number over an hundred, and the end of the tail was flattened vertically, and lengthened out as in the Crocodiles. The very frequent displacement of the caudal vertebræ, about one-fourth of the way from the extremity, is owing to the perishable caudal fin falling over as the animal dies. The Ichthyosaurus was probably naked like the Whale, but carried a prominent ridge on the dorsal surface, like that of the male Pond-Newt. When full-grown, it may have reached the length of forty feet. Of no extinct vertebrata are the materials for a complete and exact restoration more abundant and satisfactory than of the Ichthyosauri. This species is the most common form, but has not been found over seven feet in length. It derives its specific name from the intermediate character of the teeth, which are more acutely conical than in *I. communis*, and the striæ less prominent; but are less slender than in *I. tenuirostris*. The maxillary portion of the skull is relatively shorter, and converges more regularly to the snout than in *I. communis;* and the teeth are longer, more slender and numerous. This splendid specimen, now in the British Museum, was discovered by Thomas Hawkins in the Lias at Street near Glastonbury, England. The cranium and jaws, spinal column gently arched, and the four entire paddles, are very perfectly represented. According to Hawkins, there are one hundred and ten teeth in the upper jaw, and one hundred in the lower; one hundred and eleven vertebræ; thirty-nine ribs; ninety-five bones in the anterior paddle, and thirty-nine in the posterior. Size, 9 ft. 1 in. x 2 ft. 11 in. Price, $20.00.

No. 208. **Ichthyosaurus intermedius,** Conyb.

PART OF THE SKULL with the eye and sclerotic plates deeply dissected out. It was found in the Lias at Lyme-Regis, England, and is in the Garden of Plants. Size, 10 x 8. Price, $3.50.

No. 209. **Ichthyosaurus intermedius,** Conyb.

HEAD, PART OF TRUNK, AND PADDLES. This specimen was discovered in the Lias at Boll, Wirtemberg, and is in the Museum at Halle.

Size, 2 ft. 11 in. x14 in. Price, $6.00.

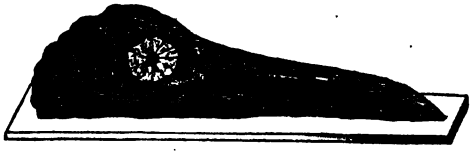
No. 210. **Ichthyosaurus intermedius,** Conyb.

RIGHT AND LEFT FORE-PADDLES. From the Lias of Lyme-Regis, England, and now in the Museum at Halle. Size, 14 x 5. Price of both, $3.00.

No. 211. **Ichthyosaurus communis.** Conyb.

SKELETON on slab. This species was the most "common" when first discovered in 1824, but has since been surpassed in regard to the known number of individuals. With respect to size, it is second only to the *Ichthyosaurus platyodon.* It is characterized by a skull wide behind and rapidly contracting to the base of the jaws, which are prolonged and sub-compressed. The teeth are relatively large, with expanded, deeply-grooved bases and round conical furrowed crowns; the upper jaw contains from forty to fifty on each side, and the lower jaw, from twenty-five to thirty. The anterior paddles have one hundred more phalangeal bones than those of *Ichthyosaurus intermedius,* and are three times longer than the posterior pair. This specimen is from the Lias of Lyme-Regis, England, and is in the British Museum. Size, 7 ft. 1 in. x 2 ft. 2 in. Price, $16.00.

No. 212. **Ichthyosaurus communis,** Conyb.



HEAD on pedestal. This is a fine specimen, having all the bones and teeth complete and in true position, and showing well the sclerotic plates which defended the eye. Discovered in the Lias at Barrow-on-Soar, England, and now in the private Geological Museum of Mr Ward, at Rochester. Size, 2 ft. 2 in. x 8 in. Price, $5.00.

No. 213. **Ichthyosaurus communis,** Conyb.

SKULL, with jaws and teeth complete. It is from the Lias at Lyme-Regis, England, and is in the British Museum. Size, 19 x 5. Price, $2.50.

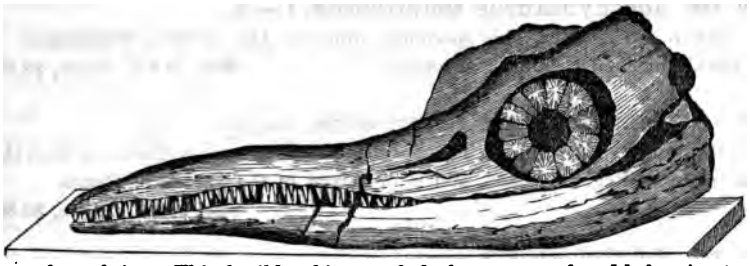
No. 214. **Ichthyosaurus communis,** Conyb.

PADDLE. From the Lias in Boll, Wirtemberg, and now in the Imperial Museum at Vienna.

Size, 11 x 5. Price, $1.25.

No. 215. **Ichthyosaurus platyodon,** Conyb.

HEAD. This species is the most gigantic of Ichthyosauri, attaining the length of thirty feet. It derives its name from the crown of the tooth being more flattened than in other species. The bodies of the vertebræ are also more compressed. The head is relatively larger than that of *Ichthyosaurus communis;* the lower jaw is remarkably massive and powerful, and projects backwards beyond the joint, as far as it does in the Crocodile. The fore and hind paddles



are of equal size. This fossil head is one of the largest ever found belonging to an Enaliosaurian. The muzzle is entire, and armed with $\frac{4}{4}\frac{5}{0}-\frac{4}{4}\frac{5}{0}$ teeth. The eye, seven and a half inches in diameter, is girt by a zone of sclerotic plates. The original was found in that ancient cemetery—the Lias beds of Lyme-Regis, England, and belongs to the Museum at Melbourne, Australia.

Size, 5 ft. 1 in. x 1 ft. 9 in. Price, $15.00.

No. 216. **Ichthyosaurus platyodon,** Conyb.

HEAD, truncated. From the Lias at Lyme-Regis, England, and now in the British Museum. Size, 2 ft. 6 in. x 1 ft. 9 in. Price, $9.00.

No. 217. **Ichthyosaurus platyodon,** Conyb.

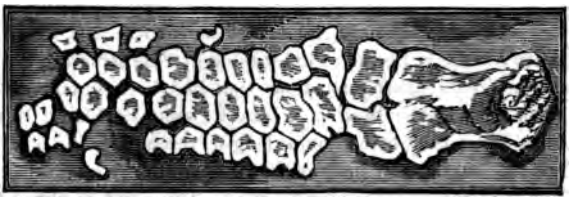
HEAD on slab. From the Lias in Glastonbury, England, and now in the Tylerian Museum at Haarlem, Holland. Size, 4 ft. 9 in. x 1 ft. 9 in. Price, $7.00.

No. 218. **Ichthyosaurus platyodon,** Conyb.

HEAD. From the Lias of Lyme-Regis, England, and now in the British Museum. Size, 16 x 10. Price, $2.00.

No. 219. **Ichthyosaurus platyodon,** Conyb.

PADDLE. From the Lias at Glastonbury, England, and is now in the Tylerian Museum at Haarlem, Holland. Size, 3 ft. 7 in. x 14 in. Price, $5.50.



No. 220. **Ichthyosaurus tenuirostris,** Conyb.

SKELETON on slab. This species is characterized by the great length and slenderness of the jaws. The intermaxillary and dentary bones are enormously prolonged. The cranium is flat, and the orbits very large. The teeth are slender—about sixty in each ramus, and the fore-paddles are much larger than the posterior pair. The animal attained the length of fourteen feet. This complete skeleton was discovered in the Lias at Boll, Wirtemberg, and belongs to M. Defour-Walderode of Prague. Size, 4 ft. 4 in. x 13 in. Price, $8.00.

No. 221. **Ichthyosaurus tenuirostris,** Conyb.

HEAD on slab. This fine head was found in Lias at Lyme-Regis, England, and is in the British Museum. Size, 37 x 12. Price, $3.00

No. 222. **Ichthyosaurus tenuirostris,** Conyb.

HEAD AND NECK. This specimen, from the Lias in Boll, Wirtemberg, is in the Cabinet of Dr. Gunther, Dresden. Size, 18 x 8. Price, $2.50.

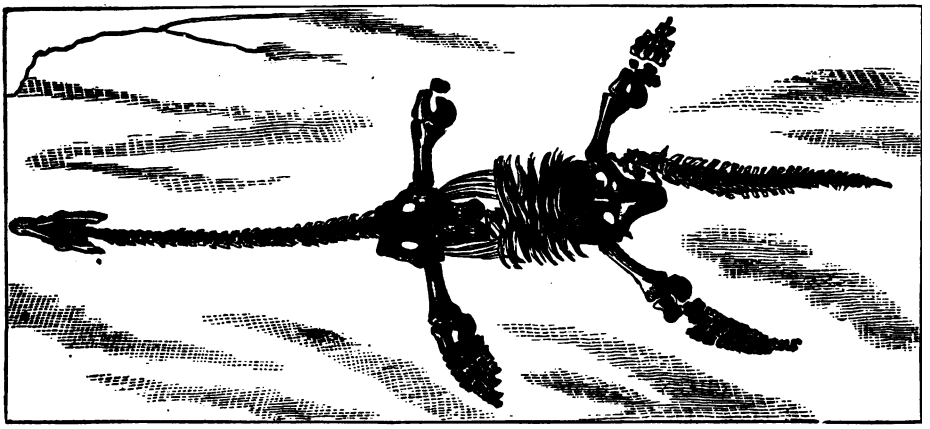
No. 223. **Ichthyosaurus tenuriostris,** Conyb.

PADDLE AND SCAPULA. This beautiful fossil, figured by Cuvier, is from the Lias at Lyme-Regis, England, and is preserved in the Garden of Plants. Size, 10 x 6. Price, $3.00.

No. 224. **Ichthyosaurus ——.**

VERTEBRA. The original, from the Lias at Lyme-Regis, England, is in the Ward Museum in the University of Rochester. Price, $0.50.

No. 225. **Plesiosaurus dolichodeirus,** Conyb.



SKELETON on slab. The Plesiosaurus was first discovered in 1823, by Conybeare and De la Beche. Cuvier thought "its structure the most singular and its characters the most anomalous that had been found amid the ruins of a former world." "To the head of a Lizard (wrote Buckland) it united the teeth of a Crocodile, a neck of enormous length, resembling the body of a Serpent, a trunk and tail having the proportions of an ordinary quadruped, the ribs of a Chameleon, and the paddles of a Whale." The skull is three times longer than its breadth, and subcompressed. The cranium is quadrate; nostrils small and situated near the eye; teeth slightly recurved, striated, sharp, long, and slender, lodged in distinct alveoli,—the anterior being the longest. The swan-like neck consists of from twenty to forty vertebræ, while living Reptiles have not over nine cervicals. The pectoral arch is remarkable for the greatly elongated and broad coracoid bones. The clavicle is united to the scapula as in Chelonia. Next to Turtles, the P. exhibits the greatest development of abdominal ribs. The ribs are articulated as in Lizards. The digits of the fore-paddle support respectively 3, 5-7, 8 or 9, 8, and 5 or 6, phalanges; those of the hind-paddle have 3, 5, 8 or 9, 8, and 6. The P. differs from the *Ichthyosaurus* in being pentadactylous, in having a long neck, longer and more flexible paddles, a shorter tail, vertebræ longer and nearly flat with two pits on the under-side, and more slender teeth. The lat-

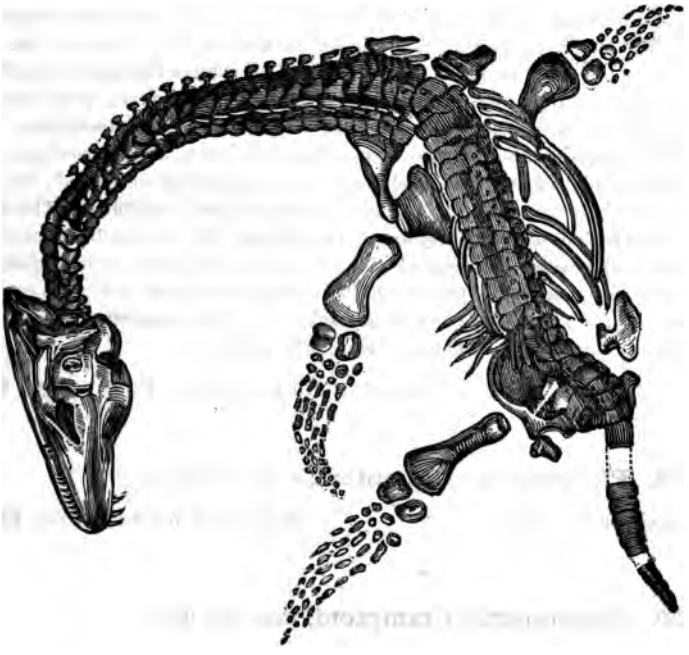
ter is generally found lying on the side; the former, extended on its back. The *P. dolichodeirus* is characterized by its extremely long neck and very small head. The proportion of the parts is nearly thus: taking the head as 1, the neck will be 5, the body 4, and the tail 3; the whole length being thirteen times that of the head. The four paddles are equal in size. This specimen from the British Museum was discovered in the Lias at Glastonbury, England.

Size, 6 ft. x 2 ft. 9 in. Price, $18.00.

No. 226. **Plesiosaurus dolichodeirus,** Conyb.

LOWER JAW. From the Lias at Glastonbury, England, and now in the Museum of the Garden of Plants. Price, $1.90.

No. 227. **Plesiosaurus macrocephalus,** Conyb.



SKELETON on slab. This species is distinguished by the relatively larger size of the head and thicker neck. The neck is three times the length of the head; and the posterior paddles are longer than the anterior pair. In this very perfect specimen, belonging to the Earl of Enniskillen, Ireland, the vertebral column is thrown into an arched position: the cervicals and dorsals form a continuous series; the tail is imperfect. Three paddles are exposed, and the upper part of the cranium with the orbits and the jaws and teeth are clearly defined. The original was discovered in the Lias of Lyme-Regis, England, by Miss Mary Anning, and described by Dr. Buckland. Size, 2 ft. 9 in. x 2 ft. 6 in. Price, $12.00.

No. 228. **Plesiosaurus Cramptoni,** Carte and Baily.

SKELETON, on slab. This splendid Plesiosaurus—the largest ever discovered, was found in 1848 in the Lias, near Whitby, England, and adorns the Natural History Museum of the Royal Dublin Society. It lies in a prone position, resting upon the ventral surface with the head and neck slightly inclined to the right. The skull is almost entirely free from the matrix, and is very perfect, excepting the zygomas. In contour it is crocodilo-lacertian; it is somewhat flattened in proportion to its length and width, tapering from the parietal crest to the snout. The orbits are obliquely placed and subtriangular in shape: the greatest diameter is five and a half inches. The nasal apertures are ovoid, and are situated just in front of the orbits. The anterior portion of the cranium is elongated and rounded at the muzzle. The lower jaw is extremely massive, its greatest length being three feet six inches, and its greatest depth six inches. The teeth number over a hundred. They resemble those of the Crocodile in their irregular arrangement, and in being implanted in distinct cavities. The large teeth are situated in front. The length of the head is to that of the neck as five to eight, and to that of the whole skeleton as one to six. The vertebral column throughout has fallen over towards the right side, presenting a slightly irregular curve, thus exposing in the cervical series a side of the centrums with their large neurapophyses. The cervical vertebræ number twenty-seven. There are thirty dorsals, having a united length of eight feet. The caudal portion is somewhat dislocated: the centrums with their spines and processes are, however, well exhibited. The vertebræ of this region number thirty-four. The ribs are well shown, being nearly in their original position. Excepting the left hind-paddle which is imperfect, the extremities are remarkably preserved. The carpal and tarsal bones are each six in number; the metacarpals and metatarsals, four. The humerus and femur are each twenty inches long. This cast is in eight pieces.

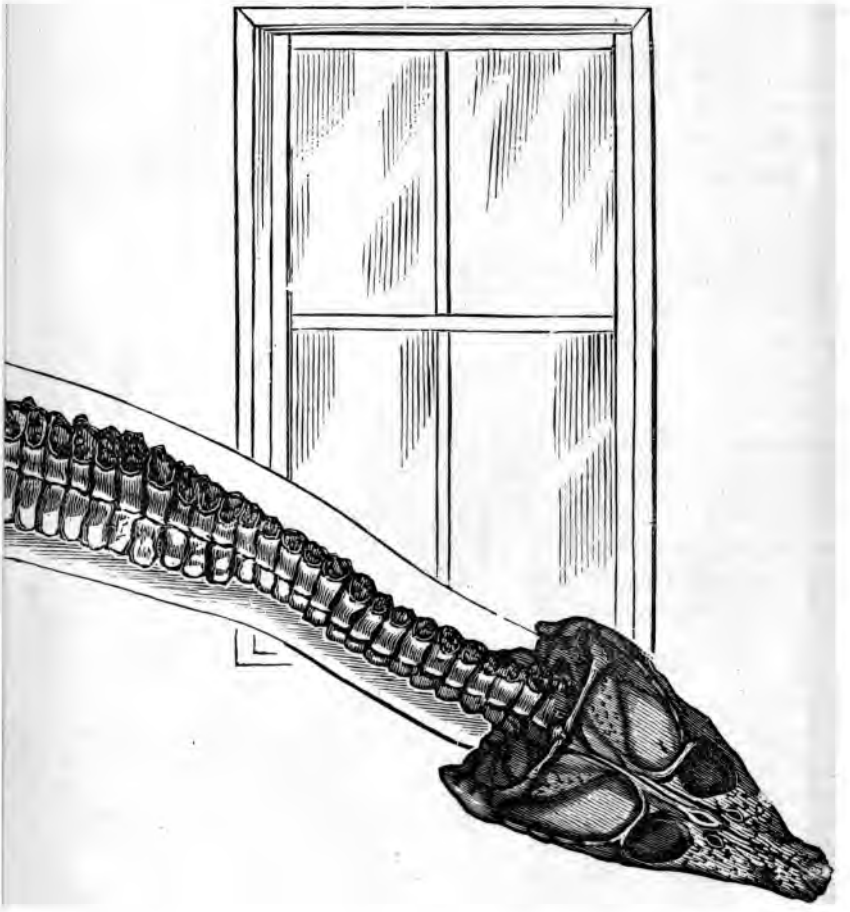
Size, 22 ft. 8 in. x 12 ft. 6in. Price, painted, $150.

No. 229. **Plesiosaurus Cramptoni,** Carte and Bailey.

HEAD, of No. 228. Size, 3 ft. 6 in. x 2 ft. Price, $15.00.

No. 230. **Plesiosaurus Cramptoni,** Carte and Baily.

LEFT FORE-PADDLE, of No. 228. Size, 5 ft. 4 in. x 14 in. Price, $10.00.



E. BALDWIN ROCHESTER N.Y.

No. 231. **Pliosaurus brachydeirus,** Owen.

PADDLE. This big-headed, short-necked, amphicœlian Reptile was more closely lacertilian than the *Ichthyosaurus*. With the exception of the teeth, which are thicker and stronger, of the vertebra of the neck, which like those of the *Ichthyosaurus* are compressed, and of the more massive proportions of the jaws and paddle-bones, the skeleton of the Pliosaurus resembles that of the Plesiosaurus. Some individuals attained the length of more than forty feet. The huge paddle was found in the Kimmeridgian bed (Upper Oolite) near Dorchester, England, and is in the Museum of that city.—Size, 7 ft. 2 in. x 1 ft. 9 in. Price, $18.00.

No. 232. **Pliosaurus grandis,** Owen.

SKULL AND LOWER JAW. This species very closely resembles the preceding. It was at first regarded by Owen as a *Plesiosaurus*. This specimen, the most interesting relic of the *Pliosaurus* yet discovered, was found in the Kimmeridge Clay (Upper Oolite) of Dorsetshire, England, and is now in the British Museum. The skull, which is over four and a half feet in length, is perfect in all except the posterior region; the lower jaw measures 5 ft. 7 in. by 2 ft.

Price, $40.00.

No. 233. **Pliosaurus grandis,** Owen.

TOOTH. This is the largest reptilian tooth among either actual or extinct forms, and rivals in size the teeth of the full grown Sperm-whale. This fine typical specimen is from the same locality and Museum as the preceding.

Size, 12 x 3. Price, $1.50.

No. 234. **Pistosaurus grandævus,** Meyer.

SKULL. In this saurian the facial part of the skull contracts abruptly in front

of the orbits, so that, viewed from above, it resembles a long-necked bottle. The orbits are situated in the posterior half of the skull, and the nostrils are lateral. This fossil was found in the Muschelkalk (Trias) at Bayreuth, Bavaria, and is in the Royal Anatomical Museum of Berlin. Size, 10 x 4. Price, $1.00.

No. 235. **Nothosaurus mirabilis,** Münst.

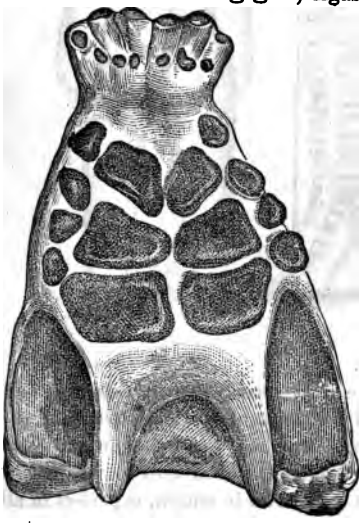
SKULL. This Triassic sea-saurian had very large temporal, orbital and nasal cavities. The premaxillary teeth were unusually long, strong and sharp; there were two similar teeth in each maxillary; the remaining serial teeth were small but acute. All the teeth were inserted in distinct cavities. The animal attained the length of seven feet. This specimen is from the Muschelkalk at Bayreuth, Bavaria, and is in the Tylerian Museum of Haarlem.

Size, 15 x 6. Price, $2.00.

No. 236. **Nothosaurus mirabilis,** Münst.

LOWER JAW, ANTERIOR HALF. From the Muschelkalk at Bayreuth, Bavaria, and now in the University Museum of Munich. Size, 9 x 3. Price, $1.00.

No. 237. **Placodus gigas,** Agass.



SKULL. This Reptile (formerly called a Fish) was an Enaliosaurian, according to Owen, breathing the air like Cetaceans. No part, save the head has been found. The cranium is as broad as long, the figure viewed from above being that of a right-angled triangle with the corners rounded off. No other number of the class has such wide temporal fossæ and strong zygomatic arches; the lower jaw, moreover, presents an excessive development of the coronoid process. These developments, for great size and power of action of the biting and grinding muscles, relate to a most extraordinary form and size of the teeth, which resemble paving stones, and were evidently adapted to crack and bruise shells and crusts of marine Invertebrates. The palatal teeth, three on each side, are of large size; the maxillary teeth, four in number, are much smaller; the premaxillary teeth, three in each ramus, are elongated and conical. The palatal are relatively larger than the teeth of any known animal, living or fossil. All these teeth are implanted in distinct sockets. This skull was found in the Muschelkalk (Trias) at Laineck, Bavaria, and belongs to the University Museum of Munich. Size, 7 x 5. Price, $2.75.

No. 238. **Placodus gigas,** Agass.

LOWER JAW. From the same locality and Museum.—Size, 7 x 4. Price, $1.50.

No. 239. **Placodus gigas,** Agass.

LOWER JAW, RIGHT RAMUS. From the same locality and Museum. Price $0.75.

No. 240. **Placodus rostratus,** Münst.

SKULL. In this species, the first two palatal teeth are relatively small; all the teeth are rounded; the maxillary and premaxillary series are nearer each other than in the *P. gigas;* and the premaxillary bone is prolonged to a beak. This specimen, from the Muschelkalk (Trias) in Bayreuth, Bavaria, is in the British Museum. Size, 8 x 7. Price, $1.75.

Pterosaurians.

No. 241. **Pterodactylus crassirostris,** Goldf.

SKELETON on slab. The Pterodactyle was one of the most extraordinary of all the creatures yet discovered in the ruins of a primeval world. Collini, in 1784, was the first to investigate the characters of this strange animal; he considered it a Fish. Blumenbach decided it was a Bird; Sömmering, a Mammal; Spix, that it was intermediate between Monkeys and Bats; Macleay, a link between Mammals and Birds; and Agassiz, a strictly marine Reptile. Cuvier, in 1800, determined the place and name it now holds.

The *P. crassirostris* is distinguished by a very large head, a comparatively short neck, and a dental formula of $\frac{1}{3}$. According to the restoration of the animal by Goldfuss, it would measure three feet from tip to tip of the wings. This specimen, which is the most perfect ever found, was discovered in the Lithographic limestone (Upper Oolite) at Solenhofen, Bavaria, associated with the remains of Dragon-flies, and is now in the University Museum at Bonn, Rhine Valley. Size, 10 x 7. Price, $3.00.

No. 242. **Pterodactylus rhamphastinus,** Wagner.

SKELETON, on slab. This fossil was found in the Solenhofen quarries (Upper Oolite) in Bavaria, and belongs to the Museum of the University of Munich. Size, 13 x 10. Price, $3.25.

No. 243. **Pterodactylus spectabilis,** Meyer.

SKELETON, on slab. (Impression and relief.) The original was found at the same locality as the preceding, and is in the Tylerian Museum, Haarlem, Holland. Size, 10 x 6. Price, $2.50.

Crocodilians.

No. 244. **Crocodilus Hastingsiæ,** Owen.

SKULL AND LOWER JAW. The true Crocodiles (Tertiary and Recent species) have vertebræ concave in front and convex behind, (excepting the first caudal vertebra which is double-convex), and short, broad muzzles. The first tooth in the lower jaw perforates the palatal process where it is concealed when the mouth is shut; the fourth tooth in the same jaw is received into a notch excavated in the side of the alveolar border of the upper jaw, and is visible when the mouth is closed. These relics of the *C. Hastingsiæ*, distinguished for its large, blunt head, were found in the Middle Eocene at Hordwell Cliffs, England, along with a true Alligator, and not far from the remains of the Gavial-like *C. Dixoni*, so that these three forms, now geographically restricted, were associated at nearly the same period in rivers flowing over what now forms the south-coast of England. As in all true Crocodiles, there is a preponderance of teeth in the upper jaw. The specimens are in the British Museum.

Size, 19 x 11. Price, with mountings, $12.00.

No. 245. **Crocodilus Champsoides,** Owen.

SKULL. This species is distinguished for the large size of the temporal holes as compared with the orbits, for the regular and rapid diminution of the head towards the snout, and for the great length and slenderness of the muzzle compared with the *C. biporcatus*. This skull was found in the London Clay (Eocene) of the Isle of Sheppey, and is in the British Museum. Size, 9 x 4. Price, $1.00.

No. 246. **Crocodilus toliapicus,** Owen.

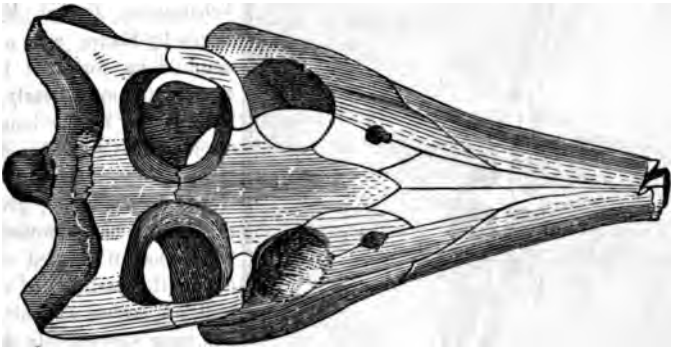
HEAD. This is probably identical with the *C. Spenceri* of Buckland. The teeth, numbering 84, are more uniform and more separated than in living Crocodiles. The remains of this species, in the hands of Cuvier, afforded the first certain proof of the existence of a true Crocodile in the Eocene deposits of England. This specimen is remarkably fine,—both jaws and teeth being beautifully preserved. It is from the same locality and Museum as the preceding.

Size, 25 x 12. Price, $6.00.

No. 247. **Crocodilus biporcatus,** Cuv.

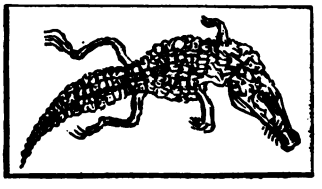
HEAD. This Crocodile, much resembling the species of the same name now living in the Ganges, was discovered in the Sewalik Hills of India (Miocene), and is in the British Museum. Size, 18 x 10. Price, $3.50.

No. 248. **Crocodilus clavirostris,** Morton.



SKULL. This is one of the first Crocodilians with cup and ball vertebra that made their appearance. This specimen was found in the Lower Cretaceous beds of New Jersey, and is in the Museum of the Academy of Natural Sciences at Philadelphia. Size, 25 x 13. Price, $7.50.

No. 249. **Crocodileimus robustus.**



SKELETON, on slab. Original from the Lithographic Limestone (Upper Oolite) in the Department of Ain, France, and now in the Museum of Natural History at Lyons. Size, 18 x 10. Price, $4.50.

No. 250. **Alligatorium Meyeri.**

SKELETON, on slab. From the same locality and Museum as the preceding. Size, 12 x 9. Price, $2.00.

No. 251. **Alligatorellus Beaumontii.**

SKELETON, on slab. (Impression and relief.) From the same locality and Museum as above Size, 9 x 9. Price, $2.00.

No. 252. **Teleosaurus Chapmanni,** König.

SKELETON, on slab. This species has a square-shaped cranium, a narrow, depressed snout, sub-circular orbits directed upwards and outwards, sharp, slender teeth, of which 140 have been counted, 64 biconcave vertebræ, 16 pairs of ribs, and dermal scutes arranged as in the Gavial, both in longitudinal and transverse series. This fine specimen, from the Whitby Lias, England, is in the British Museum. Size, 6 ft. 1 in. x 3 ft. 9 in. Price, $18.00.

No. 253. **Teleosaurus Mandelslohi,** Bronn.

SKELETON, on slab. The Teleosaurus (called *Mystriosaurus* by Kaup) was a large, amphibious, loricated Reptile, represented most nearly at the present day by the long, slender-jawed Crocodile of the Ganges—the "Gavial" of the Hindoos. Its name, given by St. Hilaire, has reference to his belief that it formed one extreme (the earliest) of the crocodilian series, as this series has been successively developed in the course of time on our planet. The jaws are armed with numerous long, slender, sharp-pointed, slightly curved teeth. In the lower jaw, the teeth are alternately longer and shorter, counting from the fourth tooth; in the upper jaw, they are of equal size, except the first two, which are small, and the third, which is very large. The nostrils are situated nearer the end of the upper jaw than in the modern Gavial; the fore-limbs are shorter, and the hind limbs are longer and stronger, which indicates that the T. was a better swimmer; the vertebra are united by slightly concave surfaces, whence it would seem that the T. lived more habitually in the water, and less seldom moved on dry land; and as its fossil remains have been found only in the sedimentary deposits from the sea, it may be inferred that it was more strictly marine than the Crocodile of the Ganges. This entire skeleton of the *T. Mandelslohi* was discovered in the Lias at Holzmaden, Wirtemberg, and belongs to Dr. Krantz, of Bonn.

Size, 7 ft. 2 in. x 2 ft. 6 in. Price, $18.00

No. 254. **Teleosaurus minimus,** Quenst.

SKULL. This relic of the smallest Teleosaurus yet described, shows well the orbital sockets and the nasal fossæ. It is from the Lias of Wirtemberg, and is now in the University Museum of Munich. Size, 6 x 4. Price, $1.12.

No. 255. **Teleosaurus longipes,** Bronn.

SKELETON, on slab. This species is distinguished by the long symphysis of the lower jaw, by a cranium narrow towards the orbits, and by anterior limbs longer in proportion than those of other species. This skeleton was found in the Upper Lias at Boll, Wirtemberg, and is in the Imperial Cabinet of Vienna.
Size, 4 ft. 4 in. x 15 in. Price, $8.00.

No. 256. **Teleosaurus Cadomensis,** Geoff.

VENTRAL SCALES, on slab. The scales of this Teleosaur are very thick, rectangular, very thick in the centre, thin towards the border, and disposed in regular series. The animal had 45 unequal teeth in each ramus. This specimen was found in the Lower Oolite limestone at Caen, France, and is in the Museum of that city. Size, 28 x 12. Price, $4.00.

No. 257. **Pelagosaurus typus,** Bronn.

SKULL, on slab. This saurian, the *Steneosaurus* of Laurillard, differs from the *Teleosaurus* by its widely separated eyes, the short symphysis of the lower jaw, and the relative shortness of the fore-limbs—they being only half as long as the hind pair. This specimen was found in the Upper Lias at Boll, Wirtemberg, and is in the Museum at Halle. Size, 13 x 5. Price, $1.25.

No. 258. **Pholidosaurus Schaumburgensis,** Meyer.

DORSAL SCALES. This saurian is known only by the vertebræ, ribs and scales. The vertebræ are double-concave. The dorsal plates are broader than they are long, and overlap each other; the ventral are rhomboidal, and only touch each other. These scales were discovered in the Wealden sand in the principality of Lippe-Schaumburg, Germany, and are in the Museum at Bücksburg.
Size, 16 x 5. Price, $1.00.

No. 259. **Leptorhynchus giganteus,** Falc. and Caut.

MUZZLE. This fossil was found in the Sewalik Hills, India (Miocene), and is in the British Museum.
Size, 2 ft. 6 in. x 11 in. Price, $8.00.

No. 260. **Leptorhynchus Gangeticus,** Falc. and Caut.

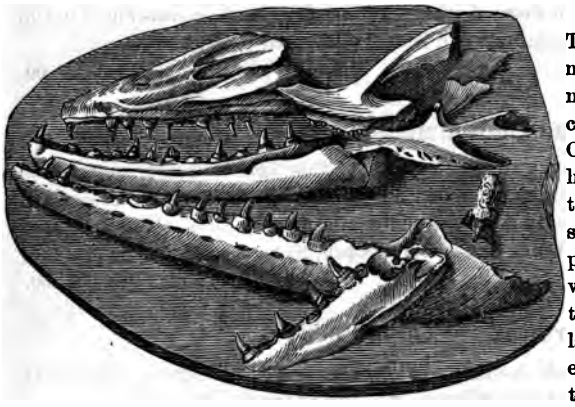
HEAD, truncated. Original from the Miocene beds of the Sewalik Hills, India, and now in the British Museum. Size, 14 x 12. Price, $5.50.

No. 261. **Leptorhynchus Gangeticus,** Falc. and Caut.

HEAD, truncated. Original from the same locality and Museum as the preceding. Size, 12 x 8. Price, $3.50.

Lacertilians.

No. 262. **Mosasaurus Hoffmanni,** Mantell.



HEAD, on slab. This is the most remarkable and extreme modification of the lacertian type in the Cretaceous Period. It had large pointed teeth, pyramidal and slightly recurved, expanding at the base, which was anchylosed to the top of the alveolar ridge. In the lower jaw there were fourteen teeth on each side and in the upper, eleven; and Cuvier supposed that the intermaxillary bone which is wanting, contained three more. In addition to these, the gigantic Reptile had its pteryoid bone armed with teeth, like the Iguana. The vertebræ were concavo-convex like those of living Crocodiles, Monitors, and Iguanas. The tail was flattened, and the feet were probably webbed. The length of this marine animal has been estimated at twenty-five feet. The remains have been found exclusively in the Chalk formation, This celebrated specimen, now in the Garden of Plants, was discovered in 1780 by Dr. Hoffmann, in the Upper Chalk, near Maestricht, Netherlands. It consists of both sides of the lower jaw, with the right ramus of the upper jaw in its natural position, and the left lying across the left ramus of the lower; the pterygoid bones; the left tympanic bone; one of the metatarsal or metacarpal bones; and some fragments.

Size, 4 ft. 10 in. x 3 ft. Price, $60.00.

No. 263. **Mosasaurus Hoffmanni,** Mant.

LOWER JAW, RIGHT RAMUS. Size, 3 ft. 1 in. x 11 in. Price, $7.00.

No. 264. **Mosasaurus Hoffmanni,** Mant.

FRAGMENT OF LOWER JAW, with old and young teeth.

Size, 18 x 7. Price, $3.00.

No. 265. **Rhynchosaurus articeps,** Owen.

TRACKS, on slab. This edentulous Reptile had a skull resembling in general aspect that of a Bird or Turtle. The feet were of very nearly equal size,

and measured from the extremity of the outermost toe to that of the innermost about one inch and a half. The toes all curved in one direction, and gradually decreased in size, and terminated with claws. The smaller and rounder prints on the slab are Chelonian tracks. This specimen was found near Liverpool, England, in the Trias (Keuper sandstone), and is in the Royal Institution of Liverpool. Size, 2 ft. 11 in. x 10 in. Price, $4.00.

No. 266. **Protorosaurus Spenceri,** Meyer.

VERTEBRÆ AND RIBS. This "fossil Monitor of Thuringia" was for a long time the earliest Reptile, known to Geologists. It was a powerful Lizard with a large head shaped like a long, slender, obtusely pointed cone; it had strong, straight jaws armed with sharp teeth—about 18 on each side of the upper, and 16 on each side of the lower jaw implanted in distinct sockets. The vertebræ were of large size and slightly concave at both ends. Both limbs were pentadactyle. These vertebræ and ribs were found in the bituminous copper-slate (Lower Permian) at Rothenburg, Germany, and are in the Palæontological Museum of Berlin. Size, 9 x 6. Price, $1.25.

No. 267. **Homœosaurus Maximiliani,** Meyer.

SKELETON, on slab. This little scaly Lizard had a relatively short body, long neck, and strong, blunt teeth. The specimen is from the lithographic slate (Upper Oolite) at Eichstädt, Bavaria, and is now in the Museum of the University of Munich. Size, 10 x 7. Price, $2.00.

No. 268. **Homœosaurus Maximiliani,** Meyer.

SKELETON, on slab. This specimen, belonging to the Tylerian Museum at Haarlem, Holland, was found at Kelheim, Bavaria, in the same formation as the preceding. Size, 9 x 5. Price, $2.00.

No. 269. **Homœosaurus brevipes,** Meyer.

SKELETON, on slab. From the lithographic slate at Eichstädt, Bavaria, and now in the Museum of the University of Munich. Price, $1.00.

No. 270. **Saphæosaurus laticeps,** Meyer.

SKELETON, on slab. The most marked departure from the lacertian type in this Reptile is the more uniform length of the phalanges of the fore-limbs. It closely resembles the *Homœosaurus*. This fossil was found in the lithographic slate at Kelheim, Bavaria, and belongs to the Tylerian Museum at Haarlem, Holland. Size, 15 x 7. Price, $3.00.

No. 271. **Phytosaurus Kapffii,** Meyer.

SKULL AND LOWER JAW. This so-called herbivorous Reptile was formerly known under the generic title of *Belodon*. It had a long, slender muzzle like the Gavial, and long, conical, curved teeth which plainly point to a carnivorous nature. Pictet says that the place

of the P. is not far from the crocodilian family. This skull was discovered in the Keuper sandstone (Upper Trias) at Stuttgardt, Wirtemberg, and is in the Royal Museum of that city. The lower jaw is in the British Museum.

Size, 2 ft. 6 in. x 13 inch. Price, with mountings, $8.00.

No. 272. **Phytosaurus Jægeri.**

FRONT OF LOWER JAW. From the same locality as the preceding, and in the Museum at Stuttgardt. Size, 6 x 3. Price, $0.75.

No. 273. **Acteosaurus Tommasinii,** Meyer.

SKELETON, on slab. This specimen is from the Lower Chalk at Comen, Austria, and is in the Museum at Trieste. The head is wanting.

Size, 10 x 5. Price, $1.25.

No. 274. **Atoposaurus Oberndorferi,** Meyer.

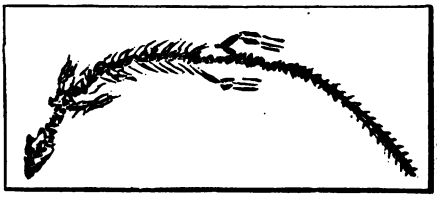
SKELETON, on slab. This fossil, belonging to the Tylerian Museum at Haarlem, Holland, is from the lithographic slate at Kelheim, Bavaria. Price, $1.25.

No 275. **Rutiodon Carolinensis,** Emmons.

HEAD. This Lacertian, found with the earliest of Mammals—the *Dromatherium*—in the Permian shales of North Carolina, has a nearly cylindrical upper jaw prolonged like that of the *Teleosaurus*, with a spoon-like enlargement at its end. The premaxillary is of one solid piece. The nostrils, which are just anterior to the large eye-sockets, descend vertically like the blow-holes of a Cetacean. The original of this cast is in the State Cabinet at Raleigh, N. C.

Size, 22 x 7. Price, $3.00.

No. 276. **Saurophidium Thollieri.**



SKELETON, on slab. From the lithographic limestone in the Department of Ain, France, and now in the Museum of Natural History at Lyons. Size, 2 ft. 7 in. x 11 in. Price, $5.00.

No. 277. **Sauranodon incisivus.**

SKELETON, on slab. From the same locality and Museum as preceding.

Size, 25 x 10. Price, $4.50.

No. 278. **Dicynodon lacerticeps,** Owen.

SKULL. This singular Reptile, hitherto found only in the Trias of South Africa, exhibits in the modifications of the skull characters of the Crocodile, Tortoise, and Lizard. It has the occipital of the first, the short, round head of the second, and the separated nasal apertures of the last. The cranium i compressed in front as in the Liz-

ard, and the occipital condyles have a similar form. The only teeth are two pointed tusks growing downwards from the upper jaw; the lower jaw was armed, like the Tortoise, with a sheath of horn. This specimen, found near Fort Beaufort, Cape Colony, is in the Museum of the Geological Society of London.

Size, 6 x 4. Price, $2.25.

Order 2 — Chelonia.

These Reptiles, according to Agassiz, are the highest members of this Class,—approaching in some points of internal organization the lower families of aquatic Birds. The main ordinal characteristic is the solid, immovable armor encasing the greater part of the body. The dorsal shield or carapax is least complete in *marine* Turtles, as the ribs extend beyond the costal plates, leaving unossified intervals. This fact affords an important aid in the discrimination of fossil Chelonians. In all, excepting the soft mud Tortoises, the whole armor is covered with dermal plates or ossified skin—homologues to the scutes of the Crocodile. The Order is also distinguished by a toothless horny beak and a single external nostril placed in the middle of the forepart of the skull. The lower jaw is one solid arch. The only movable vertebræ are the cervical and caudal. Some of the cervicals are convexo-concave, others concavo-convex, one biconcave (usually the 8th). The caudals are procoelian. The sternum is broad in the land species, narrow in the marine. The land species furnish the first instance of real walking in the Vertebrate series, unless the running of some Toads be considered as such; for Salamanders, Lizards and Crocodiles depend partly on the wriggling of the spinal column. The feet of the marine Chelonians are fin-shaped; of the fluviatile and marsh species, palmated; of the land species, club-shaped.

The two shields, usually in fragments, are the chief evidence of extinct Chelonians. The beaks are sometimes found solitary in the Chalk. According to Agassiz, the first genuine Testudinata belong to the Oolitic series. The so-called Chelonian footprints on the Potsdam, Old Red, and Triassic Sandstones are very uncertain. The earliest species are Emydians from the Solenhofen quarries.

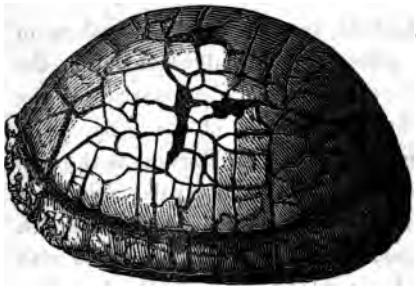
No. 279. **Colossochelys atlas,** Falc. and Caut.

CARAPACE AND PLASTRON. This gigantic Tortoise—the King of Chelonians—was a contemporary of the *Sivatherium*. The original cast, belonging to the British Museum, is a restoration from fragments discovered in the Miocene strata of the Sewalik Hills, India, and now in the Museum of the Asiatic Society of Bengal. Size, 8 ft. 2 in. x 5 ft. 10 in. Price (in three pieces, unpainted), $150.00.

No. 280. **Testudo Nebrascensis,** Leidy.

CARAPACE AND PLASTRON. This small, land-Tortoise had the general form of the *Emys*, and was much depressed. It was found in the Mauvaises Terres of Nebraska (Lower Miocene), and is the Museum of the Academy of Natural Sciences, Philadelphia. Size, 6 x 4. Price, $1.50.

No. 281. **Testudo hemispherica,** Leidy.



CARAPACE AND PLASTRON. The Carapace is more convex than that of the preceding, and the vertebral plates from the second to the eighth inclusive, are hexahedral. This specimen, found at the same locality as the *T. Nebrascensis*, is in the Ward Museum of the University of Rochester.
Size, 9 x 7. Price, $3.00.

No. 282. **Testudo ——.**

CARAPACE AND PLASTRON. This Tortoise was found in the Sewalik Hills, India (Miocene), and is in the British Museum. Size, 23 x 18. Price, $5.75.

No. 283. **Emys Hamiltonoides,** Falc. and Caut.

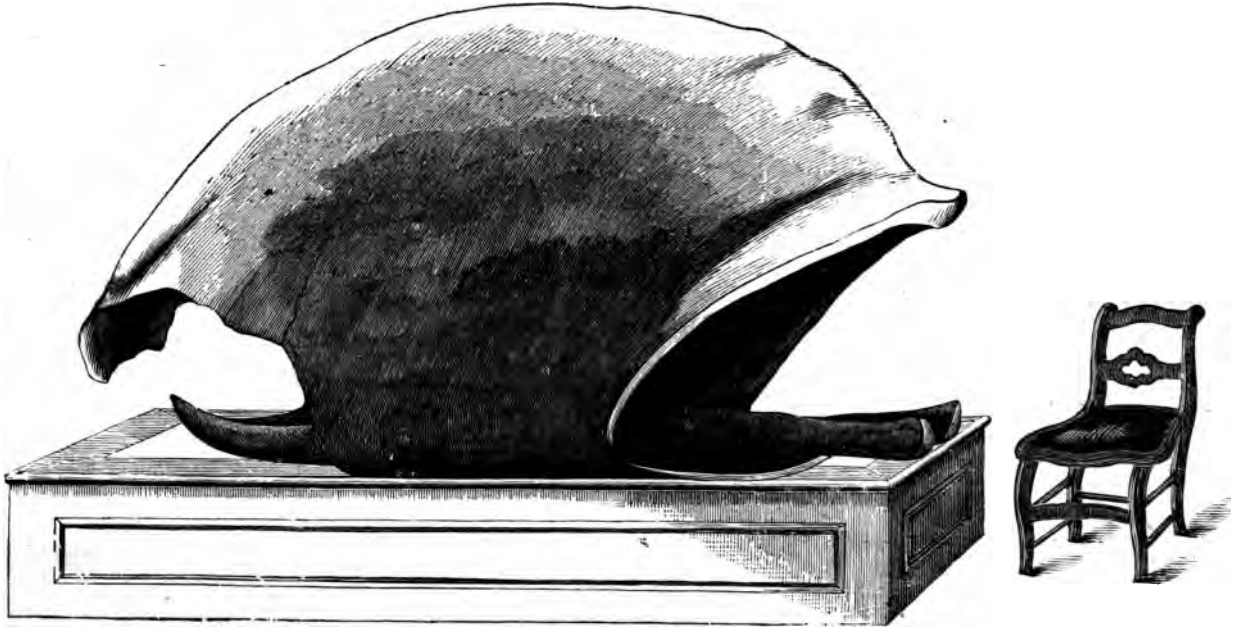
CARAPACE AND PLASTRON. From the same locality and Museum as preceding.
Size, 12 x 8. Price, $4.00.

No. 284. **Eurysternum Wagleri,** Münster.

CARAPACE, VENTRAL SURFACE, SHOWING HEAD AND EXTREMITIES. The form of this Chelonian approaches that of the fresh-water Turtles, but the limbs are comparatively short. The original is from the Lithographic Limestone (Upper Oolite), Solenhofen, Bavaria, and is in the Museum of the University of Munich. Size, 18 x 12. Price, $2.75.

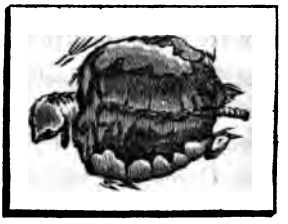
No. 285. **Pleurosternon ovatum,** Owen.

CARAPACE, on slab, showing ventral surface. This singularly modified genus is distinguished by the interposition of an additional pair of bones between the hyosternals and hyposternals. This fossil, one of the earliest evidences of Chelonian life, was found in the Purbeck Limestone (Upper Oolite) at Swanage, Dorsetshire, England, and is in the private Geological Museum of Mr. Ward, at Rochester. Size, 22 x 17. Price, $4.00.



No. 279. Colossochelys atlas.

No. 286. **Chelonemys ovata.**



CARAPACE, ventral surface. From the Lithographic quarries (Upper Oolite) at Cirin, France, and now in the Museum of Natural History of Lyons. Size, 10 x 8. Price, $3.00.

No. 287. **Chelonemys plana.**

CARAPACE. ventral surface. From the same locality and Museum as preceding. Size, 9 x 7. Price, $2.75.

No. 288. **Achelonia formosa,** Meyer.

LEFT HIND-FOOT. This relic of an emydian Turtle was obtained from the Lithographic slate (Upper Oolite) at Eichstädt, Bavaria, and belongs to the Tylerian Museum at Haarlem, Holland. Price, $0.60.

No. 289. **Hydropelta Meyeri,** D'Orbigny.

CARAPACE, on slab, ventral surface. This fresh-water Turtle lived in the Upper Oolite period, this fossil having been found in the Lithographic slates at Cirin, France. The specimen is in the Museum of the Garden of Plants. Size, 11 x 8. Price, $3.00.

No. 290. **Chelichnites,** (Actibatis Triassæ, Jardine).

TRACK, on slab. These tracks on the Permian sandstone are supposed to be the footprints of Chelonians. They are among the earliest indications of the existence of Reptiles on our planet. These ichnites were discovered in the Trias sandstone at Cornrockle Muir, Scotland, and are in the Collection of Sir William Jardine of Annandale. Size, 4 ft. x 1 ft. Price, $5.00.

ORDER 3 — OPHIDIA.

These, the most numerous of living Reptiles, have vertebræ and ribs similar to those of the Lizards, only the ribs are hollow and begin at the third vertebra from the head. They have double nostrils and loosely united cranial bones. Sternum, sacrum, scapular arch and visible limbs are wanting. But a pair of slender bones, often supporting a second bone armed with a claw, are sometimes found suspended in the flesh near the vent; and a minute sternum, clavicle, and scapula may also be detected beneath the skin. The vertebræ articulate by eight joints in addition to that of the cup and ball on the centrum, and so interlock that even in the dead state the body cannot be

twisted except in a series of side coils. The body, clothed with scales, is extremely elongated, chiefly by the multiplication of dorsal vertebræ. There are no distinctive cervical and lumbar vertebræ.

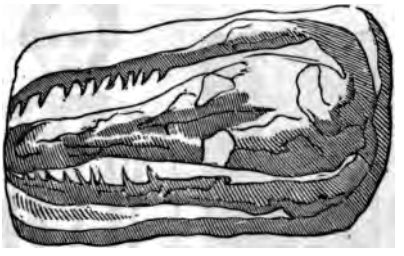
All Ophidian fossils belong to the typical group (*Colubridæ*). Their remains are vertebræ, eggs and fangs. The Eocene clay of Sheppey has yielded the earliest evidence of a Serpent,—the vertebræ of the *Palæophis toliapicus*. Species of the constricting, colubrine, and venomous families existed before any of the living species of Mammalia; and there was the same adaptation to a prone posture and a gliding movement with the belly in the dust as at the present day.

Order 4 — Amphibia.

Amphibians, the lowest members of the Class, are distinguished by a skull depressed at the expense of the cranium, two occipital condyles (the Ganocephala have no condyles), ribs absent or rudimentary, and the body naked or very rarely (as in the ichthyoid species) covered with very small embedded scales. They have no fixed type of external form. The size, shape and number of teeth vary much; sometimes the teeth are wanting. The location of teeth on the vomerine bones is the only dental character in which Amphibians differ from other Reptiles. It is only in this Order among existing Reptiles that examples are found of two or more rows of teeth on the same bone, especially on the lower jaw. The vertebræ are concavo-convex (as in the Frog), or convexo-concave (as in the Pipa), or biconcave (as in the Siren). The snake-like *Cœcilians* have no legs; the tailless *Ranadæ* have four; and the tailed *Salamandridæ* two or four.

Of the Amphibious Reptiles, the scaly *Ganocephala* appeared first, the *Archegosaurus* having been found in the Coal Measures. The *Labyrinthodonts* were introduced in the same period, but did not attain their full development till the Trias. These two extinct groups characterize the transitional period between the Palæo and Mezo-zoic epochs. They lived along with the Ganoid Fishes. The soft-skinned *Batrachians* belong to the age when most Fishes have the flexible cycloid or ctenoid scales—namely, the Tertiary and Post-Tertiary. Frogs and Salamanders have been discovered as low as the Miocene; and Toads in the Pliocene. Tailed Batrachians are now on the decline; the tailless forms are most numerous and various to-day.

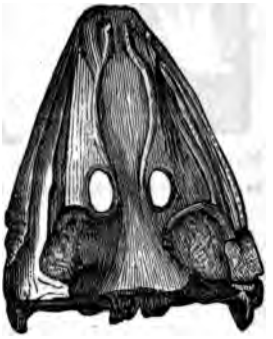
No. 291. **Archegosaurus Decheni,** Goldf.



. HEAD, on slab. This "primeval lizard" disputes with the *Sauropus* of Lea for the honor of being the first of air-breathers. Goldfuss considered it a Saurian; Agassiz claims that even in its limbs—its most Reptilian feature—it is closely like Ganoid fishes of the genus *Polypterus;* while the majority of naturalists regard it as a Proteoid Salamandrian. It had sculptured bony plates on the head like Ganoid fishes; and the greater part of the skeleton retained its cartilage. The skull is depressed and triangular, and the lower jaw differs from that of Fishes in the great length of the angular pieces, but resembles it in simplicity. The teeth are conical and of labyrinthic structure, and implanted in sockets. This specimen was discovered in the coal-field of Saarbrück, Rhenish Prussia, and is in the Cabinet of the Natural History Society at Bonn.

Size, 8 x 5. Price, $2.00.

No. 292. **Labyrinthodon (Mastodonsaurus) Jægeri,** Owen.



HEAD. This is the largest known Batrachian having labyrinthic teeth, i. e. a convergence of numerous inflected folds of the external layer of cement towards the pulp-cavity. The form of the animal was something between the Toad and Land-Salamander. The body, estimated at nine feet in length, was covered with scales. The head was triangular; the nostrils very small; and the orbits situated nearly halfway between the fore and back part of the skull. In this specimen the skull and lower jaw are firmly closed. It was found in the Upper Trias (Keuper) near Stuttgardt, Wirtemberg, and is in the Museum of that city.

Size, 2 ft. 6 in. x 2 ft. Price, $8.00.

No. 293. **Labyrinthodon (Mastodonsaurus) robustus,** Meyer.

HEAD. This species differs from the *L. Jageri* chiefly in having smaller orbital cavities. It is the *Capitosaurus* of Münster. This beautiful specimen is in two pieces, one showing both the upper and lower teeth in place, the other exhibiting the cranial plates. It is from the same locality and Museum as the preceding. Size of the head, 24 x 16; of the armor, 25 x 14. Price of both, $10.00.

No. 294. **Cheirotherium Barthi**, Kaup.

TRACK, on slab (relief). These remarkable footmarks strikingly resemble the impression of the human hand, whence the generic title. The tracks of the hind-foot are about eight inches long and five wide. Less than two inches in advance of them are the prints of the fore-feet, which are only four inches long and three wide. The foot-prints follow one another in pairs, about fourteen inches apart. Dr. Kaup, who first described these ichnites, conjectured that the animal might have been a large species of the Opossum; but in the didelphic quadrupeds the thumb is on the inner side of the hind-foot. No certain remains of the Cheirotherium have been found; but bones of *Labyrinthodon* have been found in the same locality as the foot-prints; and it is highly probable that the Cheirotherian tracks are those of Labyrinthodont Reptiles. This specimen, discovered in the New Red Sandstone (Lower Trias) at Jena, Germany, belongs to the Ward Museum in the University of Rochester. Size, 6 ft. 2 in. x 18 in. Price, $10.00.

No. 295. **Cheirotherium Barthi**, Kaup.

TRACKS WITH MUD-CRACKS. From the Trias near Hildburghausen, Saxony, and now in the Museum at Stuttgardt. Size, 2 ft. 4 in. x 15 in. Price, $4.00.

No. 296. **Cheirotherium ——.**

TRACKS. From the New Red Sandstone at Cheshire, England. Size, 3 ft. 6 in. x 1 ft. 10 in. Price, $8.00.

No. 297. **Andrias Scheuchzeri,** Tschudi.

SKELETON, on slab. This noted fossil—the *Cryptobranchus* of Van der Hœven—was a Batrachian of the Salamander family. It was a large specimen of this extinct animal which was erroneously supposed by Scheuchzer to be a human skeleton, and was described by him nearly a century and a half ago as "*Homo diluvii testis.*" Cuvier demonstrated its near affinities to the Water-Salamander (*Menopoma*) of the United States. This specimen consists of the cranium, vertebral column with ribs, the four extremities, and vestiges of the tail. It was obtained from the Miocene lacustrine deposits at Œningen, Switzerland, and is in the British Museum.

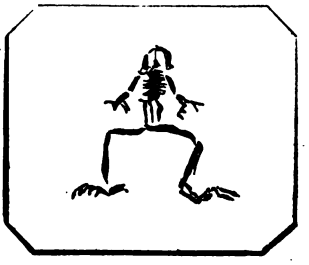
Size, 3 ft. x 8 in. Price, $5.00.

No. 298, **Andrias Tschudi,** Meyer.

SKELETON, on slab. From the Brown Coal (Miocene) at Rott, Rhine Valley, and now in the Tylerian Museum at Haarlem, Holland.

Size, 12 x 5. Price, $1.00.

No. 299. **Rana diluviana,** Goldf.



SKELETON, on slab. This specimen, now in the Ward Museum of the University of Rochester, was found in the Tertiary lignite of the "Siebengebirge," near Bonn, Rhine Valley.

Size, 7 x 5. Price, $1.00.

No. 300. **Rana diluviana,** Goldf.

SKELETON, on slab. From the same locality and Museum as preceding.

Size, 6 x 5. Price, $1.00.

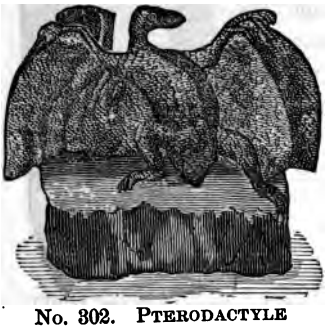
No. 301. **Sauropus primævus,** Lea.

TRACKS, on slab. These reptilian foot-prints were discovered in 1849 in formation of red shales, at the base of the Coal Measures, near Pottsville, Penn. The animal appears to have had five toes on its fore-feet, and four toes on the hind-pair; longer legs than the Crocodile, there being no trace of the dragging of the feet; and a

slender tail which left a groove-like impression. The stride from toe to toe measures thirteen inches; and the feet are about three and a half inches long. The hind-feet stepped upon nearly the same spot as the fore-feet, causing some obliteration of the first impression. The original slab is in the private Cabinet of Isaac Lea, Esq., of Philadelphia, by which gentleman it was first discovered and described. Size, 26 x 17. Price, $4.50.

No. 302–308. Restorations of Fossil Reptiles,

Pterodactyle, Megalosaurus, Iguanodon, Labyrinthodon, Ichthyosaurus, Plesiosaurus dolichodeirus and *P. macrocephalus.* They are reduced (one inch to the foot) from the gigantic models in the Crystal Palace, London; constructed to

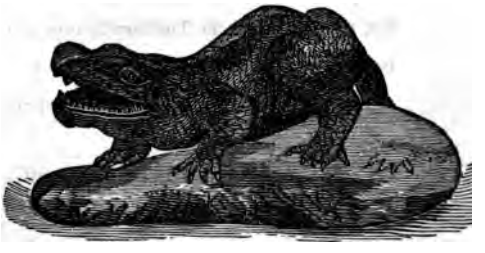


No. 302. PTERODACTYLE

No. 303. MEGALOSAURUS.

scale by B. Waterhouse Hawkins, F. G. S., F. L. S., from the form and proportions of the fossil remains, and in strict accordance with the scientific deductions of

No. 304. IGUANODON.



No. 305. LABYRINTHODON.

Professor Owen. Preliminary drawings, with careful measurements of the originals in the Royal College of Surgeons, British Museum and Geological Society,

Nos. 306–308. ICHTHYOSAURUS WITH PLESIOAURI.

were prepared, and sketch models made at a fraction of the natural size, and submitted to the above high authority. Clay models were then made of the natural size.

To give an idea of these monster Saurians, Mr. Hawkins states that the Iguanodon, as it now stands in the Crystal Palace, is composed of four iron columns, 9 feet long by 7 inches in diameter, 600 bricks, 1550 tiles, 38 casks of cement, 90 casks of broken stone, with 100 feet of iron hooping and 20 feet of cubic inch bar. It was modelled after the great Horsham specimen; and the mold was afterward converted into a *salle à manger*, in which Prof. Owen, Prof. Forbes, and twenty other scientific gentlemen sat down to dinner. These beautiful restorations are faithful copies, in miniature, of the gigantic group in London.

They are in five pieces:

ICHTHYOSAURUS WITH PLESIOSAURI:	Size, 22 x 14.	Price, $10.00.
MEGALOSAURUS:	Size, 23 x 12.	Price, $7.00.
IGUANODON:	Size, 19 x 14.	Price, $5.00.
LABYRINTHODON:	Size, 13 x 8.	Price, $5.00.
PTERODACTYLE:	Size, 9 x 9.	Price, $5.00.
	Price of the set,	$30.00.

CLASS IV. — PISCES.

This Class is the most heterogeneous among Vertebrates. No animals, indeed, exhibit such extraordinary aberration of form or assume such peculiar shapes. They are every way inferior to the other members of the sub-kingdom,—falling behind in strength and compactness of structure, in intelligence and sensibility. They readily separate into the *Osseous* and *Cartilaginous*. The former include the common Fishes or *Teleosts*, and rank lower than the Cartilaginous; they are, nevertheless, the typical forms, and are the most numerous.

Over fifteen hundred fossil species have been described. Sedimentary strata, composed of fine detritus, have been most favorable for the preservation of entire forms; but in coarse limestone and conglomerate, the principal vestiges are detached teeth, scales and bones. The Fishes of the older formations differ most from existing species; the pectoral fins are smaller and invariably placed before the ventral. Above the Chalk, the ventrals approach nearer the head. The earliest evidences of a fossil vertebrate are the dorsal spine of a Shark and a buckler like that of a *Placoganoid*, both found in the Upper Ludlow by Murchison. (A *Pteraspis Ludensis* has since been discovered in the *Lower* Ludlow of Herefordshire, England, 1859.) We may infer the co-existence of some more powerful predatory Fish against whose

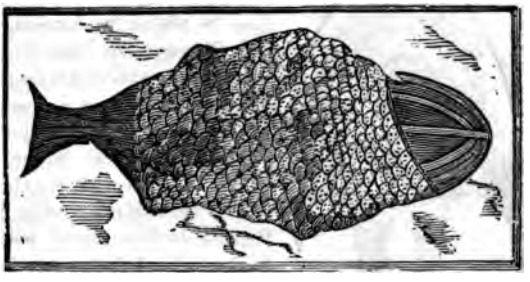
attacks these primitive sharks were thus defended. An Ichthyolite has been discovered in Indiana, claimed to be Silurian, but more probably Devonian. According to Dana, the earliest fish remains in America occur in the Schoharie grit. As the Cartilaginous Fishes dwindled, the Teleosts took their place. They began in the Cretaceous, but abounded most in the Tertiary deposits. Respecting fossil Fishes, Agassiz says: "I have not yet found a single species which was perfectly identical with any marine existing Fish, except the little Capelin (*Mallotus villosus*), which is found in the nodules of clay of unknown age in Greenland." "The *Scomberoids*" (the Mackerel tribe), observes Owen, "seem now to be at the head of the piscine modification of the Vertebrate series." The ancient Placoids and Ganoids, however, were more highly organized than the modern Cycloids and Ctenoids, and manifested a closer affinity to the air-breathing, cold-blooded Class.

Order 1 — Ganoids.

The Ganoids have a partially ossified frame, rhomboidal or angular scales, and labyrinthoid teeth. No living Ganoid has been observed in the Southern Hemisphere.

Of fossil Ganoids, 80 are found in the Devonian, 61 in the Carboniferous, 22 in the Magnesian Limestone, 23 in the Trias, 100 in the Lias, 154 in the Oolite, 36 in the Chalk, and 29 in the Tertiary. After the Triassic Period, they lost the Palæozoic feature of heterocercal tails. The Devonian species have many reptilian characters; they are often found in nodules of a flattened, elliptic form, such nodules being created by the oil of the decomposing Fish rendering the surrounding sand compact. The *Placoganoids*, which first appeared in the Upper Silurian, died out in the Carboniferous. The *Lepidoganoids* ranged from the Devonian to the Tertiary. Evidence of a true Sturgeon has not been met with below the Eocene clay of Sheppey. The Oolitic Fishes are generally homocercal Ganoids.

No. 309. **Holoptychins nobilissimus,** Agass.



BODY AND HEAD, on slab. The Holoptychians were Ganoid fishes belonging to the *Cœlacanthi*, or hollow-spined, and are characterized by the large, deeply corrugated scales covering the body, and the sculptured and granulated plates defending the head. The teeth are of two kinds —small serial teeth and large laniaries, the latter placed behind the former. The ventral fins are nearer the tail than in any other Ganoid. This splendid specimen, one of the ornaments of the British Museum, was discovered in the Old Red Sandstone at Clashbinnie, Scotland, and is figured in Murchison's "*Silurian System.*" The creature lies on its back. "The body (says Hugh Miller) measures a foot across by two feet and a half in length, exclusive of the tail, which is wanting; but the armor in which it is cased might have served a Crocodile or Alligator of five times the size." The head is short and obtuse; the lower jaw, the mouth, and the two branchial rays or plates are exposed. The scales are very large and deeply wrinkled. Size, 2 ft. 9 in. x 1 ft. 4 in. Price, $5.50.

No. 310. **Holoptychius nobilissimus,** Agass.

GROUP, on slab. From the same locality as the preceding, and now in the private Geological Museum of Mr. Ward at Rochester.

Size, 2 ft. 4 in. x 1 ft. 2 in. Price, $5.50.

No. 311. **Rhizodus Hibberti,** Owen.

LOWER JAW, LEFT RAMUS. The generic term *Rhizodus* is applied to those Holoptychians of the Coal Measures which have stout serial teeth and slender laniaries. The great strength of the cephalic plates and of the jaws and teeth shows that this was a powerful carnivorous Fish. This fragment of the lower jaw was disinterred from the Carboniferous Limestone, near Edinburgh, and is in the British Museum. Size, 19 x 7. Price, $2.25.

No. 312. **Undina striolaris,** Münst.

SKELETON, on slab. This hollow-spined, heterocercal Fish had pavement-like teeth, fitted to crush small testaceous and crustaceous animals. This specimen was found in the lithographic limestone (Upper Oolite) at Kelheim, Bavaria, and is in the Museum of the University of Munich. Size, 14 x 6. Price, $2.25.

No. 313. **Cephalaspis Lyelli,** Agass.

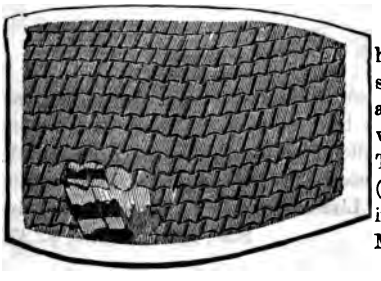
BODY AND HEAD, on slab. This well-known Devonian Fish is placed by Agassiz, Owen, and Pictet among the Placoganoids; but Huxley says it is uncertain whether the C. was a Ganoid or Teleost. The characteristic ganoin-layer is absent; the dorsal scales are rhomboidal. The first specimen of this genus was discovered by Hugh Miller. The most striking feature is the enormous buckler (made up of plates usually hexagonal), covering the head and prolonged backwards into lateral points. The head comprises fully one-third the creature's entire length. The body was protected by plates arranged transversely, and the tail carried a heterocercal fin. The dentition is unknown; but the mouth was probably placed beneath the head and suctorial, as in the Sturgeon. The eyes were placed closely together near the middle of the head. This fossil, now in the British Museum, was found in the Old Red Sandstone in Forfarshire, Scotland. Size, 9 x 5. Price, $1.50.

No. 314. **Sauropsis longimanus,** Agass.

BODY AND HEAD, on slab. This homocercal Ganoid is distinguished by very short, numerous vertebræ, scales slightly rhomboidal, small dorsal and well developed pectoral fins. The specimen—somewhat doubtful and problematic in character—was found in the Lithographic slate (Upper Oolite) at Eichstädt, Bavaria, and belongs to the private Geological Cabinet of Mr. Ward of Rochester.

Size, 17 x 7. Price, $2.00.

No. 315. **Lepidotus maximus** Wagn.

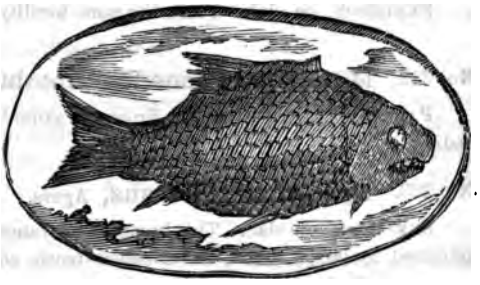


SCALES, on slab. This Ganoid had highly polished, imbricated, rhomboid scales, a short dorsal fin opposite the anal, and a homocercal tail. The vertebræ were well ossified, and the teeth were blunt. This specimen, from the lithographic slate (Upper Oolite) at Solenhofen, Bavaria, is in the Museum of the University of Munich. Size, 20 x 15. Price, $3.50.

No. 316. **Lepidotus oblongus,** Agass.

POSTERIOR PART. This Fish had small scales, and a large tail, the inferior lobe of which is more developed than the upper one. The tail, says Agassiz, is very interesting, as it enables one to see how the inferior spinous apophyses are developed in the homocercal Ganoids, whose vertebral column is prolonged into the superior lobe. The original is from the Lithographic limestone (Upper Oolite), Solenhofen, Bavaria, and belongs to the private Geological Cabinet of Mr. Ward, Rochester. Size, 18 x 11. Price, $3.25.

No. 317. **Lepidotus minor,** Agass.

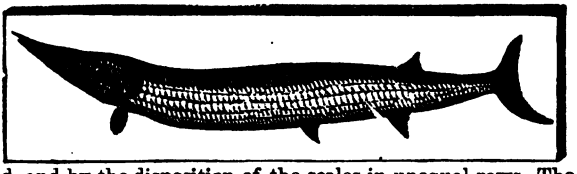


BODY AND HEAD, on slab. This fine specimen of another homocercal lepidoid—distinguished by its small, shining scales, and unusually perfect in all its parts—was discovered in the Purbeck Limestone (Upper Oolite) on the Isle of Portland, England, and is in the British Museum. Size, 17 x 10. Price, $3.00.

No. 318. **Caturus latus,** Münst.

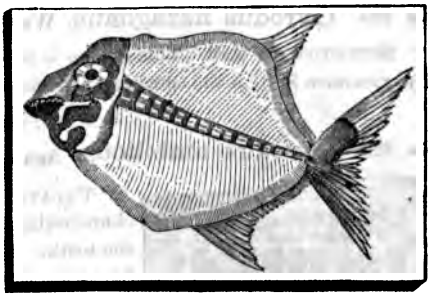
SKELETON, on slab. This Fish belongs to the same family as the preceding, and in general shape approaches the Salmon. It has delicate scales, and fins of moderate size. It is probably only a variety of the *C. furcatus*, Agass. This specimen is from the Lithographic limestone of Eichstädt, Bavaria, and belongs to the private Geological Cabinet of Mr. Ward. Size, 8 x 3. Price, $1.25.

No. 319. **Aspidorhynchus speciosus,** Agass.



BODY AND HEAD. on slab. This homocercal Ganoid is characterized by a long body of nearly equal size throughout, by a pointed head, and by the disposition of the scales in unequal rows. The scales are wrinkled, and sometimes hexagonal, sometimes tetragonal. This specimen belongs to Dr. Krantz of Bonn, and is from the same locality as the preceding. Size, 2 ft. 2 in. x 7 in. Price, 2.75.

No. 320. **Microdon (Pycnodus) elegans,** Agass.



SKELETON, on slab. This beautiful Ganoid with homocercal tail and small, uniform teeth, is a true *Pycnodus* according to Wagner. The specimen is from the Lithographic limestone (Upper Oolite) of Kelheim, Bavaria, and is now in the Museum of the University of Munich. Size,10x10. Price, $2.25.

No. 321. **Microdon (Pycnodus) notabilis,** Münst.

SKELETON, on slab. From the same locality and Museum as the preceding. Size, 11 x 5. Price, $2.00.

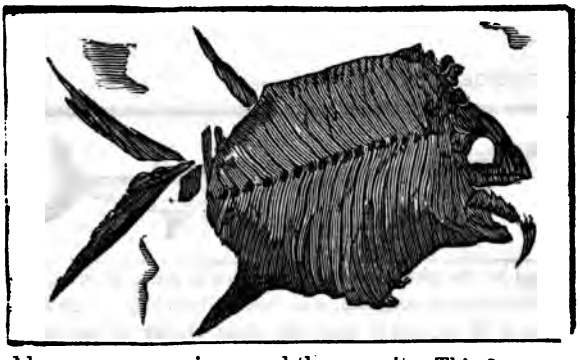
No. 322. **Microdon (Pycnodus) notabilis,** Münst.

PALATAL TEETH, on slab. From the same locality and Museum as the preceding. Price, $0.50.

No. 323. **Pycnodus platessus,** Agass.

SKELETON, on slab. This homocercal Ganoid was a deep-bodied Fish, characterized by large, round, flat-crowned teeth, covering the broad jaws as by a pavement of several rows. The profile of the head is nearly vertical. The posterior part of the body is slender in comparison with the anterior part. This complete skeleton was found in the Eocene limestone of Monte Bolca, Lombardy, and is in the Museum of the University of Munich. Size, 13 x 6. Price, $2.25.

No. 324. **Gyrodus circularis,** Agass.

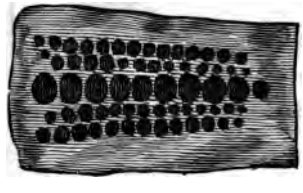


SKELETON, on slab. This Fish has the exterior form of *Pycnodus*, and is also a Ganoid. The anal and dorsal fins are sustained by long rays in front, and diminish rapidly; the caudal is deeply notched. The teeth are elliptical, and are characterized by a groove running round the summit. This fine specimen, from the Lithographic slates of Solenhofen, Bavaria, is in the Museum of the University of Munich. Size, 2 ft. 6 in. x 1 ft. 5 in. Price, $6.00.

No. 325. **Gyrodus hexagonus,** Wagn.

SKELETON, on slab. This species is called *Microdon hexagonus* by Agassiz. The specimen is from the same locality and Museum as the preceding. Size, 8 x 7. Price, $1.75.

No. 326. **Gyrodus umbilicus,** Agass.



PALATAL TEETH, on slab. This species is characterized by a depression in the middle of the teeth. This fine series of palatal teeth was found in the Upper Oolite at Durrheim, Grand Duchy of Baden, and is in the same Museum as the preceding. Price, $1.00.

No. 327. **Gyrodus umbilicus,** Agass.

PALATAL TEETH, on slab. From the same locality and Museum.

Price, $0.75.

No. 328. **Megalurus lepidotus,** Agass.

SKELETON, on slab. This genus of homocercal Ganoids is distinguished by a large head with jaws armed with large and small teeth intermingled and by a large, round tail. The scales resemble those of the Carp. This complete skeleton was found in the Lithographic slate (Upper Oolite) of Solenhofen, Bavaria, and is in the Museum of the University of Munich. Size, 17 x 8. Price, $2.50.

No. 329. **Megalurus elegantissimus,** Wagn.

SKELETON, on slab. This small Ganoid Fish, with largely expanded, homocercal tail, is from the same locality and Museum as the preceding.

Size 8 x 5. Price, $1.00.

ORDER 2 — PLACOIDS.

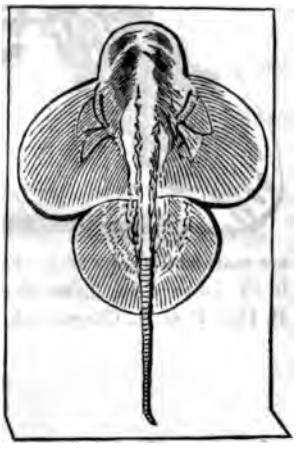
The Placoids (or *Selachians* as they are now more generally termed) have a purely cartilaginous skeleton and a rough skin, often composed of rhombic or angular plates, each rising into a point at the centre. The teeth are confined to the maxillary and mandibular bones. This Order Agassiz in his "*Contributions*" elevates to a Class.

The Placoids, being Cartilaginous, have left little behind save spines, teeth, and a few scales. The fossil spines are called *Ichthyodorulites*, and abound in the Secondary deposits. Agassiz enumerates in his "*Poissons Fossiles*" about 70 species. Of extinct Placoids, 2 are known to be Silurian, 7 Devonian, 82 Carboniferous, 38 Permian, 25 Lias, 60 Oolite, 52 Chalk, and 86 Tertiary. The *Cestracionts* began in the Lower Devonian, and culminated in the Trias. The *Squalodonts* or True Sharks, began in the Jurassic and culminated in the Miocene. The *Hybodonts* began in the Trias and culminated in the Jurassic. The *Rays* appeared first in the Carboniferous and the *Chimæroids* in the Oolite.

No. 330. **Squatina acanthoderma,** Fraas.

BODY AND HEAD, on slab. This extinct Placoid approached the Ray family, by the situation of the eyes on the dorsal face and by the development of the pectoral fins. The mouth was at the end of the muzzle. The contour and outer border of the body has left a full impression on the stone. This fine fossil was discovered in the Lithographic slate (Upper Oolite) at Eichstädt, Bavaria, and is in the Tylerian Museum at Haarlem, Holland.

Size, 2 ft. 5 in. x 1 ft. 8 in. Price, $7.00.



No. 331. **Thaumas alifer,** Münst.

SKELETON, on slab. This Placoid has the essential characters of the *Squatina*, save certain modifications of the tail fins. This skeleton was found at the same locality as the preceding, and is in the Museum of the University of Munich.

Size, 21 x 9. Price, $3.00.

No. 332. **Thaumas speciosus,** Meyer.

SKELETON, on slab. This species is also called by Meyer, *Squatina speciosa.* From the same locality and Museum as the preceding.

Size, 8 x 6. Price, $1.50.

No. 333. **Carcharias.**

TWO TEETH. These teeth of a fossil Shark were found in the Chalk of Kent, England, and belong to the Ward Museum in the University of Rochester. Price of the pair, $1.25.

No. 334. **Squala?**

VERTEBRÆ. These segments of the spinal column of a Shark were found in the Chalk of Kent, England, and are now in the British Museum.

Price, $2.25.

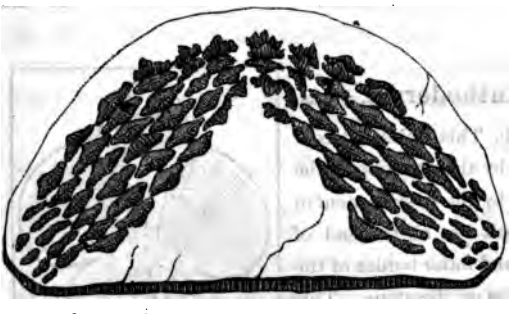
No. 335. **Cochliodus contortus,** Agass.

PALATAL TEETH. In this cestraciont Placoid, the large crushing dental plates appear to be welded into a single mass, and are admirably adapted to crack and bruise the shells of Mollusks and Crustaceans. This specimen was found in the Carboniferous limestone at Bristol, England, and belongs to the British Museum. Price, $0.50.

No. 336. **Acrodus nobilis,** Agass.

PALATAL TEETH. The teeth of this Placoid (allied to the Port Jackson Shark), from the finely striated character and dark color of the grinding surface, are called by quarrymen "fossil leeches"; and even the savans of a century ago regarded them as petrified worms. This specimen is from the Lias of Lyme-Regis, England, and is now in the British Museum. Price, $1.00.

No. 337. **Acrodus Anningiæ,** Agass.



LOWER JAW. This remarkably fine specimen exhibits an almost complete series of teeth, retaining the position they occupied during life. There are eight transverse rows on each side, with a central row at the junction of the two rami. The teeth of the posterior row are marked with the striæ characteristic of the genus. The specimen was found in the Lower Lias, Lyme-Regis, England, and belongs to the Collection of E. C. H. Day, F. G. S., Charmouth, England. Price, $1.50.

No. 338. **Ptychodus decurrens,** Agass.

GROUP OF TEETH. The teeth of this Cestraciont are of large size and of a more or less square form. The crown of the tooth is deeper than the root, and the summit is granulate at the margin. This specimen was found in the Chalk at Kent, England, and is in the British Museum. Size, 6 x 3. Price, $2.00.

No. 339. **Ptychodus decurrens,** Agass.

TWO TEETH. From the same locality and Museum. Price, $1.25.

No. 340. **Ceratodus ——.**

TWO TEETH. The teeth of this Cestraciont are puzzling from the variety of shapes they assume. They have in general an uneven or undulating upper surface of dentine and enamel, and an under-layer of reticulated osseous tissue. These specimens are from the Upper Trias (Keuper) at Stuttgardt, Wirtemberg, and are now in the Ward Museum of the University of Rochester. Price. $0,80.

No. 341. **Notidanus eximius,** Wagn.

SKELETON, on slab. (Young). The teeth of this Shark, instead of having one conical point, have a series of unequal sharp points, resembling in this respect the lower jaw-teeth of the living "Grisets." This specimen was found in the lithographic limestone (Upper Oolite) at Eichstädt, Bavaria, and is in the Museum of the University of Munich. Size, 8 x 4. Price, $1.00.

No. 342. **Mesturus verrucosus,** Wagn.

SKELETON, on slab. This fine fossil Fish is from the same locality and Museum as the preceding. Size, 22 x 14. Price, $4.00

No. 343. **Edestes ——,** Leidy.

PORTION OF DORSAL SPINE. This remarkable ichthyodorulite was discovered in the Coal Measures of Indiana, and is preserved in the Cabinet of Amherst College It is distinguished for the large proportional size of the marginal teeth and their close resemblance to the jaw-teeth of *Carcharias*, their enamelled border being finely denticulate.

Size, 9 x 3. Price, $1.50

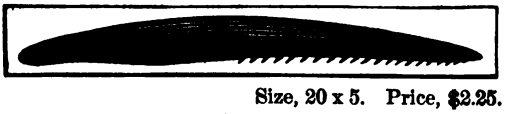
No. 344. **Ichthyodorulite.**

FOSSIL DORSAL SPINE, on slab. From the Lias of Lyme-Regis, England, and now in the Ward Museum of the University of Rochester.

Size, 14 x 4. Price, $2.00.

No. 345. **Ichthyodorulite.**

FOSSIL DORSAL SPINE, on slab. From the same locality and Museum as the preceding.



Size, 20 x 5. Price, $2.25.

Order 3 — Cycloids.

These osseous Fishes are distinguished by their circular, imbricated, unenamelled scales with concentric markings. The dorsal fin is spiny, as in the Mackerel, or Soft-rayed, as in the Salmon.

This Order is not represented by any species of older date than the Cretaceous epoch. The Chalk has yielded 21 species, and the Tertiary 154. Nearly all belong to extinct genera.

Order 4 — Ctenoids.

This Order includes the Teleostian Fishes with comb-like scales, generally of a rounded or ovoid form, and spiny dorsal fin, like the Perch.

They were ushered into being along with the Cycloids. Of the 195 fossil forms described, 11 are from the Chalk.

No. 346. **Beryx superbus**, Dixon.

Group, on slab. The genus *Beryx*, of which there are two existing species in the Australian seas, represented the Perch family during the Cretaceous period. The characteristics are a large, blunt head, one dorsal fin with several spinous rays in front of the soft ones, and large, round, pectinated scales. This specimen was found in the Lower Chalk at Lewes, England, and is in the private Cabinet of S. H. Beckles, Esq., of Brighton, England. Size, 28 x 14. Price, $12.00.

No. 347. **Holocentrum pygæum**, Agass.

Skeleton, on slab. This genus, still represented in the Pacific Ocean, belongs to the same family as *Beryx*. This species is shorter and stouter than the living one, with a larger head and smaller anal fin. The specimen is from the Middle Eocene beds of Monte Bolca, Italy, and is in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 3. Price, $1.50.

No. 348. **Cololites**, Agass.

These tortuous and convoluted intestinal-like masses and impressions have been called *Lumbricaria*, Münst., from the supposition that they were worm-casts. But Prof. Agassiz considers them the petrified intestines of Fishes or the contents of the intestines which have preserved the form of the tube, and have thus been fossilized. They are generally found isolated. This specimen is from the Lithographic limestone (Upper Oolite) at Eichstädt, Bavaria, and is in the Ward Museum of the University of Rochester. Price, $1.00.

SECOND SUB-KINGDOM.

ARTICULATA.

The Articulata—incomparably the most numerous division of the Animal Kingdom—include all the Invertebrates having jointed bodies. The skeleton is external, the skin hardened in most cases into a bony crust, affording the necessary fulcra to the muscles of locomotion. This skeleton is sometimes in the form of successive rings; these, in the higher Orders, are soldered together, so that only two or three divisions, or one solid shield, can be discovered. The jaws, when present, are lateral. "The most minute comparison (says Agassiz) does not lead to the discovery of a distinct plan of structure uniting all these animals into one natural primary group. What holds them together and keeps them at a distance from other groups, is not a common plan of structure, but a greater simplicity in their organization."

The Palæontological history of the Articulata is much behind that of the other divisions of the Animal Kingdom. So universally distributed and numerically abundant at the present day, they are least perfectly represented among the relics of a former world. Their manifold, complex organization, which in the recent state fits them so admirably for generic and specific comparisons, is fatal to their entire preservation, and the fossil examples are often so fragmentary as to admit of little more than the determination of their Class and Family. The number catalogued forms but a small proportion of those which have probably existed. Bronn enumerates 1551 fossil Insects, 131 Arachnoids, 894 Crustaceans, and 292 Annellids. Representations of each Class are found in the Palæozoic rocks.

CLASS I.—CRUSTACEA.

In this class the skeleton has the form of an external crust or shell, which covers even the antennæ, hairs, jaws, and teeth. In the smaller species it is chitinous; in others it is hardened by the carbonate and phosphate of lime. The normal number of segments is 21, for the head, thorax, and abdomen, seven each. But most frequently the anterior segments form one piece called the cephalothorax, leaving the abdomen joined, terminated by a compound tail-piece, *pygidium*. This *heteronamity*, or the having no generally equal number of body-rings, is the most essential class characteristic. All Crustaceans are organized for life in the water, though many live chiefly on land. The earliest forms were Trilobites.

Nearly all the other fossil Crustaceans are Decapods. The oldest approach nearest to the existing tropical species; while the more modern ones have a greater resemblance to temperate species. Those found fossil in the tropics are more akin to the Crustacea now found in the same latitude. In general we may say that the Palæozoic Trilobites are followed by Lobsters in the Jurassic Period, and by Crabs in the Tertiary. The Upper Oolite of Solenhofen opens like a book filled with compressed and wonderfully preserved Shrimps and Lobsters, while the London Clay of the Isle of Sheppey is a rich repository of short-tailed Crustaceans. The Articulates which came latest are the *Cirripedes*, whose lowest species (*Pollipeds*) appears in the Lias. The fossil forms (of which 69 have been described) belong chiefly to the sessile division.

Sub-Class II.—Malacostraca.

The section Malacostraca includes nearly all the large, and many of the smaller species with which we are most familiar. They have either ten or fourteen feet; their body is divided into thorax and abdomen with seven segments in each; the Decapods (Crabs, Lobsters and Shrimps) being the highest of the class. The Macrourans abound in the Oolite and Cretaceous strata, while the Brachyourans attain their maximum development in Tertiary beds and modern seas.

No. 349. **Lobocarcinus Paulo-Wurtemburgensis,** Meyer.

This interesting and well-preserved fossil Crab occcurs in considerable numbers in the Lower Tertiary (Nummulitic) beds of the Gebel Mokattam in the suburbs of Cairo, Egypt. Original in the Ward Museum of the University of Rochester.

Size, 6 x 4 in. Price, $1.50.

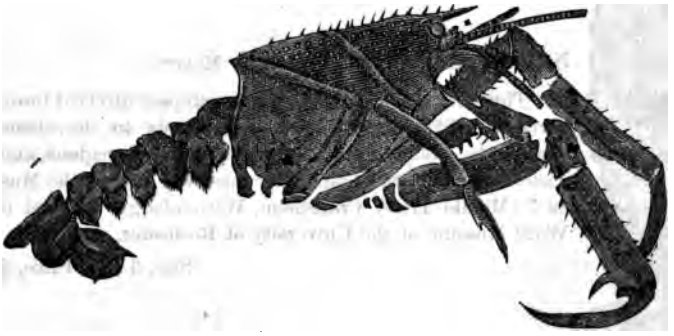
No. 350. **Macrophthalmus Latreillei,** Edwards.

This fossil Crab, closely allied to a living species, is found in beds of Newer Tertiary age in the Isle of Hainan, China. Original in the Ward Museum of the University of Rochester. Price, $0.75.

No. 351, **Palæocorystes Stokesii,** Mantell.

Two specimens, Carapace. A small Crustacean—intermediate in form between the *Brachyoura* and *Anomoura,* and quite abundant in the Gault of Folkestone, England. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 352. **Scapheus ancylochelis,** Woodward.



This beautiful and very perfect Crustacean from the Lias of Lyme-Regis, England, was a burrowing Decapod with long monodactylous fore-limbs armed with spines. The cephalothorax was one-third longer than deep, and shorter than the abdomen; the rostrum was prominent, curving upwards, and had a double row of conical, slightly curved spines; the tail was long, and the lobes were broad and spinous. Size, 10 x 5. Price, $1.75.

No. 353. **Enoploclytea Sussexiensis,** Mantell.

CLAW. This "armed Shrimp" is one of the largest forms of the *Macroura* —or "long-tailed" Decapod Crustacean,—which occur fossil. It is from the Lower Chalk of Lewes, England. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.80.

No. 354. **Eryon propinquus,** Germar.

This remarkable form of Crustacean bears a long, flattened shield with a round, fissured front. It is from the Lithographic limestone (Upper Oolite) of Eichstädt, Bavaria.

Size, 6 x 5. Price, $1.50.

No. 355. **Eryon Cuvieri,** Desm.

This is the *Macrourites arctiformis* of Schlotheim. From the same locality as the preceding. Original in the Ward Museum of the University of Rochester.

Size, 6 x 4. Price, $1.25.

No. 356. **Cancrinos latipes,** Münster.

CARAPACE. From the Lithographic limestone (Upper Oolite) of Eichstädt, Bavaria. Size, 6 x 4. Price, $0.75.

No. 357. **Pseudoglyphea eximia,** Oppel.

From the Oxford Clay (Upper Oolite) of Wirtemberg. Price, $0.60.

No. 358. **Pemphyx Sueurii,** Meyer.

This long-tailed Decapod has a carapace divided into three parts, of which the anterior corresponds to the abdominal region, the middle to the heart and genital regions, and the posterior to the branchial. The specimen is from the Muschelkalk (Middle Trias), Crailsheim, Wirtemberg. Original in the Ward Museum of the University of Rochester.

Size, 6 x 3. Price, $1.25.

No. 359. **Æger longirostris,** Münst.

A macrourous Decapod from the Lithographic limestone (Upper Oolite) of Solenhofen, Bavaria. Size, 10 x 7. Price, $1.50.

No. 360. **Megachirus locusta,** Germar.

This Decapod from the Lithographic limestone (Upper Oolite), Solenhofen, Bavaria, is the *Locustrina marina* of Bayer. It has a long tail, and a carapace prolonged in front into a beak. But it is chiefly remarkable for the extreme length of the anterior legs, which are clawless, and terminated with fin-like appendages. The original is in the private Geological Cabinet of Mr. Ward, Rochester. Size, 9 x 5. Price, $1.25.

No. 361. **Macrourites modestiformis,** Schlot.

The original, now in the Ward Museum of the University of Rochester, is from the same locality as the preceding.

Price, $0.60.

No. 362. **Macrourites ——?**

From the same locality and Cabinet as the preceding. Price, $0.60.

Sub-Class II.—Entomostraca.

The Crustacean species which compose this division are usually small and covered, partially or wholly, by a thin horny shell of bivalvular form. The absence of a series of abdominal appendages is the most persistent characteristic. A few of the fossil Entomostracans are of quite large size, but the majority are very minute and in such countless numbers that they assist by their multitudinous atoms in building up thick strata of the earth's crust. The larger and more highly organized forms occur in the Palæozoic Rocks.

No. 363. **Dithyrocaris Neptuni,** Hall.

CAUDAL SPINES. This large Phyllopodous Crustacean had a naked body, or only the head and thorax covered by the carapace; foliaceous and gill-bearing limbs, serving as respiratory and natatory organs, and numerous feet. Its tail was armed by a very conspicuous trifid spine. Hamilton Group (Devonian), Otsego Co., N. Y.

No. 364. **Limulus giganteus,** Münst.

This ancient "King-Crab," like those of the present day, was covered by a cephalo-thoraxshield; the appendages were all oral; and the eyes were sessile and placed in the upper surface of the shield. It belongs to the Crustacean order Pœcillopod, or those which have the feet of different segments of the body applied to different uses. This fine specimen is from the Lithographic limestone (Upper Oolite) of Eichstädt, Bavaria.

Size, 20 x 12. Price, $3.00.

No. 365. **Limulus Walchii,** Desm.

A slab which shows the specimen both in impression and in relief. From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 10 x 6. Price, $2.00.

No. 366. **Limulus Walchii,** Desm.

From the same locality as the preceding. Size, 7 x 5. Price, $0.60.

No. 367. **Eurypterus lacustris,** Harlan.

The genus Eurypterus—the Idotea of Scouler—was established by De Kay in 1825. The name is an allusion to the broad, oar-like, swimming feet. The body is composed of an anterior oval carapace, six thoracic and six abdominal segments, and a somewhat obtuse tail-spine. The eyes were on the surface of the carapace. There were five pairs of appendages, all oral, of which the hinder

pair were dilated into paddles. The basal joints of the first four performed the work of mastication as in the King-Crab. This specimen was found in the Waterlime Group (Upper Silurian), Williamsville, Erie Co., N. Y.

Size, 9 x 9. Price, $1.50.

No. 368. **Eurypterus lacustris,** Harlan.

This specimen, from the same locality, is of medium size, and lies with the dorsal side exposed. The carapace has been detached. The body is curved, and the tail directed forward. Size, 7 x 6. Price, $1.00.

No. 369. **Eurypterus remipes,** De Kay.

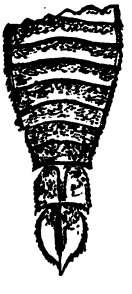
The carapace of this species is more attenuated, being about three-fourths as long as wide, and the tail-spine is somewhat slender and triangular in form. From the same locality as the two preceding. Size, 13 x 10. Price, $2.25.

No. 370. **Pterygotus acuminatus,** Salter.

This genus was established by Prof, Agassiz in 1844. It derives its name from the peculiar character of its foot-jaws, which, from their scale-like sculpture, were at first mistaken for the remains of a Fish. Like the *Eurypterus*, the P. may be described as a "lobster-like Crustacean," since it has an elongated body composed of a cephalo-thorax, an abdomen with a dozen segments, and a tail-plate. It differs from the *Eurypterus*, in having a less number of joints in the feet, in the eyes being marginal, and in the large size of the antennæ. This fine specimen was discovered in the Upper Silurian beds of Lesmahago, Lanarkshire, Wales. Size, 24 x 13. Price, $3.75.

No. 371. **Pterygotus acuminatus,** Salter.

This specimen shows well the singularly square form of the head-shield and the marginal position of the eyes on its anterior border. From the same locality as the preceding. Original in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 6. Price, $0.60.



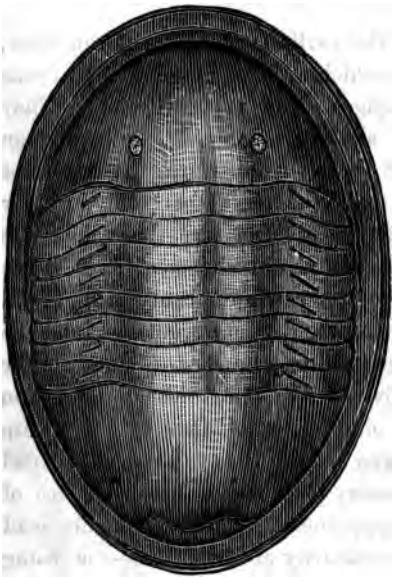
No. 372. **Pterygotus Anglicus,** Agass.

BODY, SEGMENTS AND TAIL. This species—one of the forms upon which the genus was founded—is the largest of known Crustaceans, either living or extinct. A proportionate completion of the entire body would give an animal of from seven to eight feet in length! The original, from the Old Red Sandstone of Sidlaw Hills, Forforshire, Scotland, is in the British Museum. Size, 2 ft. 7 in. x 12 in. Price, $3.25.

Trilobites.

These extinct Crustaceans were the earliest members of the class, meeting us in the first formations in which we have any abundant forms of marine life. They do not belong to any modern group. They resemble both the Entomostracans and Tetradecapods, but have an independent position. They have been likened to the larvæ of the Horse-Shoe Crab. The structure of the tergal part only of their body is well known. The longitudinal division into three lobes is not always distinct; but the head, thorax and abdomen (or tail) are generally well-defined. The head is covered by a crescent-shaped shield or *buckler :* the thorax consists of from two to twenty segments; and the *pygidium*, or abdominal shield, is composed of a number of joints more or less anchylosed. The buckler is divided by a longitudinal depression into *cheeks*, or lateral areas and the *glabella*, or middle area. A suture running from the anterior and posterior sides of the eye outward is called the *facial suture;* a prominent accessory piece on the under surface of the head, covering the mouth, is the *hypostoma.* The union of the head crust by sutures is a remarkable peculiarity of Trilobites,—not being traceable in any other Crustaceans, and only found in true Insects of the present world. The genera of Trilobites are distinguished mainly by the form and markings of the head and tail, and by the eyes. Variations in the length of the cephalic and caudal spines and in the prominence of the head-lobes, have been considered indications of difference of sex. No antennæ have been detected, nor any feet (save in one specimen of *Calymene*): the latter are supposed to have been rudimentary or membranous. They probably lived gregariously in the shallow waters of bays and coasts, swimming on their backs; and from the form of the labrum of the mouth, it is inferred that they were carnivorous. The embryos are simple discs. Barrande has made out the probable eggs. More than 400 species of Trilobites are known, grouped in about 50 genera. Of these, 46 are Silurian, 22 Devonian, and 4 Carboniferous. According to Bronn, 13 genera are peculiarly Lower Silurian, 3 Upper Silurian, 1 Devonian, and 3 Lower Carboniferous. The spinous feature reached its maximum in the Devonian. Trilobites, incapable of rolling themselves up, are of more ancient geological date than those which can: they are chiefly found in the Lower Silurian. Those having the power of rolling themselves up, have larger and more projecting eyes, a tougher horny membrane, and a caudal shield resembling the buckler. Trilobites not granulated occur only in the most ancient and the newest Palæozoic strata; while the granulated species are found in the middle beds.

No. 373. **Asaphus gigas**, Dalmann.



This large Trilobite, the *Isotelus gigas* of De Kay and *Isotelus megistos* of Locke, has an oval form and convex surface; the head and tail nearly equal and both subtriangular; well developed eyes; eight body-segments; and no glabella, nor any ribs on the tail. This cast is a restoration by Professor Locke from fragments discovered in the Trenton limestone (Lower Silurian), in Adams Co., Ohio. It is well adapted for lecture-purposes, exhibiting on a large scale the prominent parts of these ancient Crustaceans.

Size, 22 x 14. Price, $3.75.

No. 374. **Asaphus gigas**, Dalm.

A large specimen from the Hudson River Group (Lower Silurian), Cincinnati, Ohio. Size, 10 x 7. Price, $2.00.

No. 375. **Asaphus gigas**, Dalm.

From the same locality as the preceding. Size, 10 x 6. Price, $1.75.

No. 376. **Asaphus gigas**, Dalm.

This specimen shows well the long posterior processes of the cephalic shield. It is from the same locality as the preceding. Price, $0.60.

No. 377. **Asaphus gigas**, Dalm.

Hypostoma with a portion of the cephalic shield, and showing its position beneath the same. From the same locality as the preceding. Price, $0.30.

No. 378. **Asaphus gigas**, Dalm.

Hypostoma. From the Utica Slate (Lower Silurian), Mohawk Valley, N. Y. Price, $0.30.

No. 379. **Asaphus expansus**, Dalm.

From the Lower Silurian at Motala, Sweden. (Coiled.) Price, $0.20.

No. 380. **Asaphus expansus**, Dalm.

From the same locality as the preceding. Size, 10 x 7. Price, $1.75.

No. 381. **Asaphus ingens**, Barrande.

From the Lower Silurian slate of Beraun, Bohemia.

Size, 12 x 7. Price, $1.25.

No. 382. **Asaphus tyrannus,** Murchison.

This species, one of the largest known, is peculiarly British, and is even restricted to Wales and the border counties. It is readily distinguished from the *A. gigas* by its more expanded form and strongly furrowed pygidium. The tail is longer and more convex than the head. It is the most highly ornamented of the *Asaphidæ*. This specimen (with parts of the cephalic and caudal shields restored) was found in the Llandeilo Flags (Lower Silurian), at Bishop's Castle, Wales. Size, 10 x 6. Price, $1.50.

No. 383. **Asaphus Barrandi,** Hall.

This specimen, the tail of which is wanting, shows the hypostoma through a fracture in the cephalic shield. From the Trenton Limestone (Lower Silurian), Platteville, Wisconsin. Size, 7 x 6. Price, $1.75.

No. 384. **Asaphus Barrandi,** Hall.

From the same locality as the preceding. Size, 6 x 5. Price, $1.25.

No. 385. **Amphion Fischeri,** Eichwald.

This genus approaches the *Calymene*, but is distinguished by its nearly rectangular glabella and by its numerous (from 15 to 18) body-rings. This specimen, representing the animal coiled up, is from the Lower Silurian at Pulkowa, near St. Petersburg, Russia. Price, $0.20.

No. 386. **Acidaspis Buchii,** Barr.

This Trilobite is distinguished generically by its eight small but strongly arched body-rings, and by the surface being covered regularly with tubercules. This specimen is from the Lower Silurian slate at Beraun, Bohemia. Price, $0.80.

No. 387. **Acidaspis mira,** Beyrich.

From the Upper Silurian at St. Iran, Bohemia. Price, $0.50.

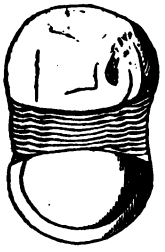
No. 388. **Angelina (Ogygia) Sedgwicki,** McCoy.

From the Lower Silurian at Garth, North Wales. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 389. **Bathynotus holopygia,** Hall.

This new Trilobite has a semi-elliptical cephalic shield with spiny processes, prominent glabella, eleven articulations in the thorax, and a distinct, semi-oval pygidium. The specimen, which is an impression of the animal from which most of the shell has been removed, is from the Quebec group (Lower Silurian), Georgia, Vermont. Price, $0.50.

No. 390. **Bumastus (Illænus) Barriensis,** Murch.



This genus of Trilobites is characterized by the great breadth and convexity of the cephalic and caudal plates and the faintness of the longitudinal, trilobate markings. The genus closely resembles Illænus, and this species is only distinguished from *I. crassicauda* by the fact that the broad axis is not strictly separated from the lateral lobes. The specimen is from the Niagara Group (Upper Silurian), New York. Price, $0.75.

No. 391. **Bumastus (Illænus) Barriensis,** Murch.

This specimen, which shows well the broad expanded buckler, the ten body segments, and the caudal shield, is from the Upper Silurian at Dudley, England. Price, $1.00.

No. 392. **Bronteus Brongniarti,** Barr.

The ten-jointed Trilobites constituting this genus, have a short articulated caudal axis, and a very large circular caudal shield; they are unable to roll themselves up. This species was found in the Upper Silurian at Tetin, Bohemia. Price, $0.50.

No. 393. **Bronteus planus,** Barr.

From the Upper Silurian at Beraun, Bohemia. Price, $0.30.

No. 394. **Calymene Blumenbachii,** Brongniart.

This well known genus derives its name from the obscurity which long hung over the real nature of these crustaceans. In this species, the cephalic shield is large, convex, rounded in front with a well-marked border, boldly three-lobed, and having prominent, but not very large eyes, set widely apart; the thoracic portion consists of thirteen segments; and the pygidium is small and nearly semi-circular. It is often found coiled up. This specimen is from the Upper Silurian at Dudley, England. The original is in the Ward Museum in the University of Rochester. Price, $1.00.

No. 395. **Calymene Blumenbachii,** Brong.

Two specimens, coiled. From the same locality as the preceding. Price, $0.50.

No. 396. **Calymene senaria,** Conrad.

The most obvious distinction between this and the preceding species consists in the slight but conspicuous tuberculation of the segments of the middle lobe of the thorax at their extremities. This fossil is from the Lower Silurian at Cincinnati, Ohio, and is in the Ward Museum of the University of Rochester. Price, $0.80.

No. 397. **Calymene læviceps,** Dalm.

This specimen (coiled) is from the Lower Silurian at Motala, Sweden. Price, $0.20.

No. 398. **Ceraurus pleurexanthemus,** Green.

This genus is closely allied to the *Acidaspis* of Murchison. In this species the buckler is crescent form; the eyes small, distant, and granulated; the glabella deeply furrowed on each side; the thorax has eleven articulations, and the caudal shield four. This specimen is a restoration by adjustment of fragments from different individuals discovered in the Trenton Limestone and Hudson River Group (Lower Silurian). Price, $1.25.

No. 399. **Ceraurus pleurexanthemus,** Green.

This specimen, showing the hypostoma on the lower side, was found in the Trenton Limestone (Lower Silurian) near Ottawa River, Canada. Price, $0.80.

No 400. **Chirurus claviger,** Beyrich.

Two specimens. These loosely built Trilobites resemble *Phacops*. The number of body-rings is eleven. The fragments of this species were discovered in the Lower Silurian at Wesela, Bohemia. Original of the glabella in the Ward Museum of the University of Rochester. Price, $0.60.

No. 401. **Conocephalus Sulzeri,** Schloth.

This Trilobite has a cephalic shield not unlike a half-moon, very small eyes, a glabella separated by deep furrows from the lateral lobes, and fourteen joints. The specimen is from the Lower Silurian at Ginetz, Bohemia. Price, $0.40.

No. 402. **Cychaspis Chrystyi,** Hall.

This Trilobite was found in the Niagara Group (Upper Silurian) at Waldron, Indiana. Price, $0.30.

No. 403. **Dalmania (Cryphæus) Boothii,** Green.

This genus is distinguished by an ovate oblong body, convex and trilobed; a buckler with two reticulated tubercles; aad a long, lobate tail. The head and upper part of the body closely resemble those of *Calymene*. This specimen is from the Devonian at Huntingdon, Pennsylvania. Price, $0.25.

No. 404. **Dalmania (Cryphæus) Boothii,** Green.

Showing the under-side of the tail. From the Hamilton Group (Devonian), Ontario Co., N. Y. Price, $0.25.

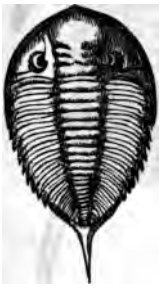
No. 405. **Dalmania (Cryphæus) calliteles,** Green.

Pygidium, showing the lobes more deeply cleft than in the preceding species. From the Hamilton Group, York, N. Y. Price, $0.25.

No. 406. **Dalmania Hausmanni,** Barr.

This species is closely allied to, if not identical with the preceding. It is from the Lower Silurian at Dworetz, near Prague, Bohemia. Price, $0.50.

No. 407. **Dalmania (Phacops) limulurus,** Green.



This Trilobite, also called *Asaphus limulurus,* is one of the most common forms. It has a sublunate buckler, a lobed glabella, eyes of medium size, eleven body articulations, and fifteen caudal. The body and caudal portion is more frequently found separated from the cephalic shield. This specimen is from the Niagara Group (Upper Silurian) at Lockport, N. Y.

Price, $ 0.50

No. 408. **Dalmania micrurus,** Green.

Pygidium, from the Lower Helderberg (Upper Silurian), Schoharie Co., N.Y.

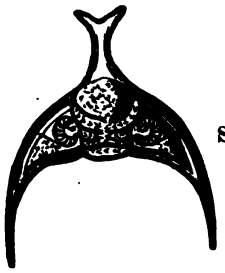
Price, $0.50.

No. 409. **Dalmania myrmecophora.**

PYGIDIUM; impression and relief. This specimen shows the broad, moderately convex caudal shield with thirteen rings beautifully ornamented with a double row of nodes. No entire specimen of this species—"the largest trilobite by far," says Hall, "which occurs in the higher rocks of our system"—has ever been found. From the Upper Helderberg Group (Devonian), Genesee Co., N.Y.

Size, 9 x 8. Price, $3.00.

No. 410. **Dalmania nasutus,** Conrad.



Buckler, restored; from the Lower Helderberg (Upper Silurian) in Schoharie County, N. Y.

Size, 7 x 6. Price, $1.75.

No. 411. **Dalmania nasutus,** Conrad.

Buckler; two specimens; from the same locality as the preceding.

Price, $1.75.

No. 412. **Dalmania nasutus,** Conrad.

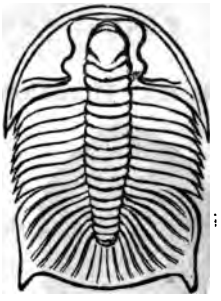
Pygidium with spine; impression and relief. From the same locality as the preceding. Price, $1.25.

No. 413. **Dalmania nasutus,** Conrad.
Under side of the head; from the same locality as the preceding.
Price, $0.60.

No. 414. **Dalmania selenurus,** Eaton.
From the Upper Helderberg limestone (Devonian) at Auburn, N. Y.
Price, $0.75.

No. 415. **Dalmania socialis,** Barr.
Two specimens; from the Lower Silurian, Bohemia. Price, $0.75.

No. 416. **Dikelocephalus Minnesotensis,** Owen.

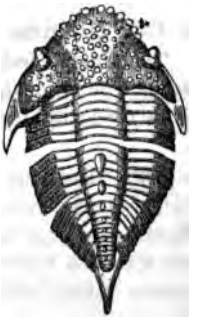


Central portion of the head with cheek, placed on the same slab with tail. The body segments are wanting in this specimen, and portions of the cheeks and tail are restored. This is one of the earliest of the Trilobite forms. From the Potsdam sandstone (Lower Silurian), Mazomania, Wisconsin. Size, 9 x 8. Price, $1.75.

No. 417. **Dindymene Bohemica,** Barr.
In this Trilobite, the glabella is not lobed, the eyes and facial suture are not apparent, and the thorax has ten segments. It is from the Lower Silurian, Rokycan, Bohemia. Price, $0.20.

No. 418. **Dionide formosa,** Barr.
From the Lower Silurian at Beraun, Bohemia. Price, $0.30.

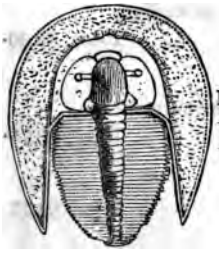
No. 419. **Encrinurus punctatus,** Brünn.



From the Upper Silurian (Wenlock), Dudley, England. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 420. **Ellipsocephalus Hoffi,** Schloth.
From the Lower Silurian in Bohemia. Price, $0.25.

No. 421. **Harpes ungula,** Barr.



HEAD. From the Upper Silurian limestone at Kroniepruss, Bohemia. The body-segments and tail are usually wanting, as is the case in this specimen. Original in the Ward Museum in the University of Rochester.

Price, $0.30.

No. 422. **Harpides Grimmi,** Barr.

From the Lower Silurian at Przibram, Bohemia. Tail wanting.

Price, $0.75.

No. 423. **Homalonotus delphinocephalus,** Murch.

This genus is so named because the three-lobed aspect so characteristic of the family is, in a great measure, obliterated, and the back appears smooth and uniform. The cephalic and caudal shields are hyperbolic; the rings number thirteen. This species is characterized by the distinct trilobation of the tail in all its stages of growth, as well as by its slender body and acute caudal extremity. The specimen is from the Upper Silurian at Dudley, Eng. Size, 7 x 4. Price, $1.25.

No. 424. **Homalonotus Dekayi,** Green.

This species is from the Hamilton Group (Devonian), Madison Co., N. Y.

Size, 7 x 4. Price, $1.25.

No. 425. **Illænus crassicauda,** Dalm.

This trilobite (coiled) shows finely the broad spherical buckler or cephalic shield. The original, from the Lower Silurian of Christiania, Norway, is in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

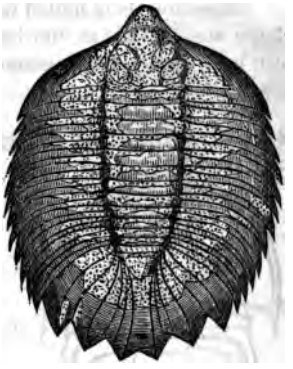
No. 426. **Illænus giganteus,** Brong.

The general form of this species is variable from its contractility. It has ten articulations; prominent eyes; and large, convex buckler and caudal shield. This specimen is from the Lower Silurian, Angers, France, and is in the Ward Museum of the University of Rochester. Size, 7 x 7. Price, $1.00.

No. 427. **Illænus Taurus,** Hall.

This Trilobite (coiled) is from the Trenton Limestone (Lower Silurian), Mineral Point, Wisconsin. Price, $0.50.

No. 428. **Lichas Boltoni,** Green.



This beautiful Trilobite, rarely found entire, is easily recognized by its peculiar scabrous surface, depressed body and head, and the free extremities of the segments pointing backwards. It is from the Niagara Group (Upper Silurian), Lockport, N. Y. Size, 7 x 6. Price, $1.50.

No. 429. **Lichas (Tetraspis) grandis,** Hall.

HEAD PORTION. This is a most remarkable Trilobite form, by reason of the deep furrows, tuberculated surface, and high, elongated nodes which diversify and give a monstrous appearance to the cephalic buckler. From the Schoharie grit (Devonian), Schoharie Co., N. Y. Original in the Ward Museum of the University of Rochester. Size, 7 x 6. Price, $1.75.

No. 430. **Lichas (Tetraspis) grandis,** Hall.

PYGIDIUM. This specimen shows the reversed aspect of the caudal shield with the strong ribs which sustain it, and long projecting spines. From the same locality and the same Museum as the above. Size, 6 x 6. Price, $1.50.

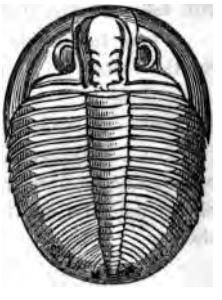
No. 431. **Lichas pustulosus,** Hall.

Pygidium; from the Lower Helderberg (Lower Silurian), Schoharie Co. N. Y. Price, $0.60.

No. 432. **Lichas Trentonensis,** Conrad.

From the Hudson River Group (Lower Silurian), Cincinnati, O. Price, $0.30.

No. 433. **Ogygia Buchii,** Goldf.



This genus of trilobed crustaceans, so named in allusion to their being found in the earliest fossiliferous formation, is distinguished by a flat, semi-circular cephalic shield, a very distinct facial suture, eight body segments with free extremities, and a many-jointed caudal shield with an axis as long as the body. It belongs to the *Asaphida.* This specimen is from the Llandeilo Flags (Lower Silurian), South Wales. Price, $0.60.

No. 434. **Olenus Tessini,** Dalm.

This genus, long united to *Paradoxides*, is distinguished by the enlargement of the caudal shield at the base, thus assuming a trilateral shape. It has fourteen body-rings. This specimen is from the Lower Silurian at Horrowitz, Bohemia. Size, 10 x 4. Price, $1.00.

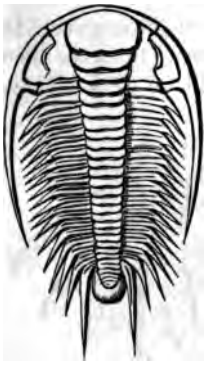
No. 435. **Olenellus Vermontana,** Hall.

From the Quebec Group (Lower Silurian), Georgia, Vt. (Tail wanting.) Price, $0.30.

No. 436. **Olenellus Thompsoni,** Hall.

From the Quebec Group (Lower Silurian), Georgia, Vermont. Price, $1.75.

No. 437. **Paradoxides Bonemicus,** Böck.



Two specimens. This genus is distinguished by a broad club-shaped glabella, large head-spines, oblong eyes, from 17 to 20 flat body-rings, and a very small pygidium. It includes some of the largest Trilobites known. From the Lower Silurian at Ginetz, Bohemia.

Size, 6 x 3. Price, $1.00.

No. 438. **Paradoxides Harlani,** Green.

This specimen, in which the tail is wanting, was found in the Quebec Group (Lower Silurian), Braintree, Massachusetts. Size, 12 x 9. Price, $2.50.

No. 439. **Paradoxides Davidis,** Salter.

From the Lower Lingula Flags (Lower Silurian), St. Davids (Pembroke), South Wales. Size, 11 x 9. Price, $2.00.

No. 440. **Parodoxides spinulosus,** Broug.

BODY AND CAUDAL SEGMENTS. This specimen, showing well the backward prolongation of the ribs on the caudal portion, is from the Lower Silurian of Skrey, Bohemia, and is now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75

No. 441. **Phacops bufo** (var. rana), Green.

Trilobites of the genus *Phacops* have very large, prominent, granulated eyes, forming a segment of a cone, distinct trilobation, and eleven body-rings. This species, the *Calymene macrophthalma* of Brongniart, and perhaps identical also with the *Phacops latifrons* of Bronn, has a very convex head, occupying one-third of the whole length, a tuberculated glabella, and the eleven pleuræ bent down at the extremities. There are 66 lenses in each eye. This specimen (coiled) is from the Hamilton Group (Devonian), Ontario Co., N. Y.

Price, $0.40.

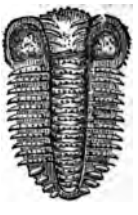
No. 442. **Phacops cephalotes,** Corda.

From the Upper Silurian Limestone at Tetin, Bohemia. Price, $0.60.

No. 443. **Phacops Logani,** Hall.

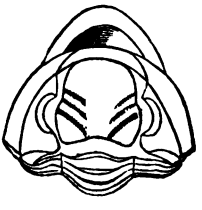
From the shaly limestone of the Lower Helderberg Group (Upper Silurian), New York. Price, $0.60.

No. 444. **Placoparia Zippei,** Böck.



From the Lower Silurian, Rokycan, Bohemia. Price, $0.30.

No. 445. **Prœtus longicaudus,** Hall.



In this genus, the eyes are of moderate size, very prominent, smooth, and joined rather closely to the glabella; and the body has ten segments. This specimen (coiled) is from the Hamilton Group (Devonian), Iowa. Price, $0.25.

No. 446. **Staurocephalus Murchisoni,** Barr.

In this genus, the head is almost globular, glabella large; eyes minutely facetted; thorax of eleven joints, and tail of three segments. This species, which occurs in both hemispheres, was found in the Upper Silurian at Listice, Bohemia. Price, $0.25.

No. 447. **Sphærexochus mirus,** Beyr.

Two specimens. This curious Trilobite has a globular head, projecting eyes, and ten pointed body-rings. It is from the Upper Silurian, Beraun, Bohemia. Price, $0.75.

No. 448. **Trinucleus concentricus,** Eaton.

GROUP. In this genus, the pygidium is enlarged at the expense of the thorax. The former is triangular; and the latter has only six rings. The animal is never found fully rolled up. This specimen is from the Hudson River Group (Lower Silurian), Loraine, N. Y.

Price, $1.00.

No, 449. **Trinucleus concentricus,** Eaton.

Two specimens. The originals of this cast are from the same locality as the preceding, and are now in the private Geological Cabinet of Mr. Ward.

Price, $0.60.

Nos. 373—449. This entire series of Trilobites,—represented in 85 specimens, 36 genera and 61 species,—will be furnished, boxed, for $50.00.

No. 450. **Ichnites.**

TRACKS, on slab. These tracks appear to have been left by some crustacean animal. They are from the Clinton Group (Upper Silurian), in Herkimer Co., New York. Size. 9 x 6. Price, $0.80.

CLASS II. — INSECTA.

Insects are the most prolific of animals, and are essentially terrestrial or ærial. The body is articulated and chitinous; the limbs articulated and provided with hooks.

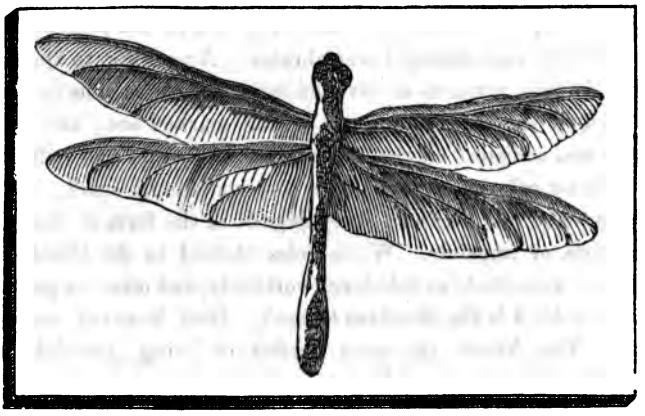
Arachnidans have only two divisions to their bodies, the cephalothorax and abdomen. They have eight legs (the most constant external character), and never more than eight smooth eyes. According to Agassiz, Insects are superior to Spiders. Owen holds the contrary.

Insects proper consist of three parts: the head, thorax, and abdomen. They have thirteen rings; six legs; and two or four wings. The modifications of the last furnish the characters by which the Order is divided.

Thr *Myriapods* are the only members of the class which have more than eight feet in the perfect state, and in which the abdomen is not distinct from the thorax. The head, also, is not prominently distinct. They are all wingless; and metamorphic development exhausts itself in the successive acquisition of new segments and legs. They live and grow longer than other Insects.

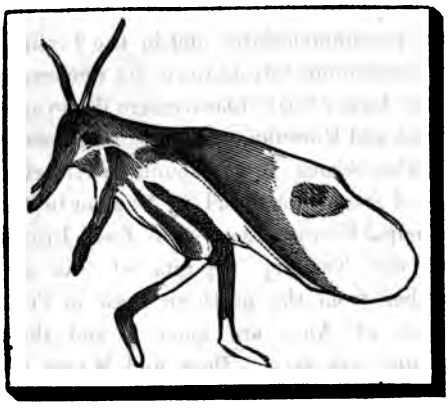
The Class of Insects is represented in the Palæozoic age. Of Arachnidans, the earliest is the fossil Scorpion from the Bohemian Coal-Measures. Spiders are found in the Solenhofen-slates and in the Tertiary gypseous marls of Aix. The Carboniferous forests were not uncheered by the hum of Insects; for in the Lower Coal Measures are discovered fossils resembling the living Locust and Curculio. The *Blattina venusta* from Arkansas is the only Carboniferous Insect found in America, excepting perhaps the articulated fragments found by Dawson in the trunk of a Sigillaria. The principal European sources of fossil Insects are the slates of Solenhofen, the Tertiary deposits of Aix and Œningen, and the masses of amber from the northern coast of Prussia. About 100 Tertiary species of Ants are known; and these are either male or female: neuters are rare. Bees and Wasps are comparatively few.

No. 451. Æschna eximia, Hagen.



This beautiful fossil "Dragon-Fly" was found in the Lithographic limestone (Middle Oolite), at Solenhofen, Bavaria. It is a neuropterous insect of the genus *Æschna*, which differs from the *Libellula* proper only in the *equal* division of the lower lip. The eyes are large and close together, and the wings remain horizontal in the state of repose. In this specimen, the wings, both pairs of which are finely preserved, spread six inches. The original is in the private Geological Cabinet of Mr. Ward. Size, 7 x 5. Price, $1.25.

No. 452. **Locusta speciosa,** Münst.



This fossil Locust was discovered in the Lithographic limestone (Middle Oolite) at Eichstädt, Bavaria. Like the Dragon-Fly above, it was doubtless blown far out from the shore which bordered the marine waters of the old Solenhofen Sea. The calcareous mud at the bottom of this sea was of the most impalpable fineness, and enveloped closely all organisms which become imbedded in it, copying with beautiful exactness their most perishable portions and most delicate linings.

Size, 7 x 7. Price, $1.25.

CLASS III. — ANNELIDA.

Worms lie at the lowest step of the Articulate series. They are distinguished by a soft, annulated body of a lengthened form, without any division into cephalo-thorax and abdomen, and by the possession of red blood—the only case among Invertebrates. According to Quatrefages, the Annelid fauna presents no division into zoölogic regions or centres of creation which in other classes are so well marked out; and moreover, on granite and schistose shores, the number of species and individuals is large, while on calcareous coasts it is correspondingly small.

Worms have left traces in every deposit in the form of shelly coverings, burrows, or imprints. Worm-holes abound in the Potsdam sandstones; they were made at tide-level, vertically, and often in pairs. The most common kind is the *Scolithus linearis*. Hall, however, reckons this a Fucoid. The *Nereis*, the most perfect of living Annelids, is also found fossil in the Silurian, where it has left clear imprints of its cylindrical body and of the tuft-like appendages thickly distributed—a pair to each segment—along its sides, and which served it both in respiration and in locomotion. *Serpulites* abounded most in the Oolitic seas. The regular *Tentaculites* and vesicular *Cornulites* of the Upper Silurian are supposed by Murchison and others to be Annelids.

No. 453. **Serpula ——.**

The *Serpulæ* derive their name from the tortuous and twisted tubes they inhabit. These tubes are calcareous and quite elaborate, and are seen on our sea-coasts incrusting stones, shells, driftwood, sea-weed, &c. In the tropical waters, the shelly exuviæ of living species form banks, resembling coral-reefs in their solidity and strength. The animal is fixed, and lower in rank than the naked Annelids. The original of this specimen, attached to a fragment of stone, is from the Raised beaches (Pleistocene) of the eastern shore of the Red Sea, and is in the Ward Museum of the University of Rochester. Price, $0.60

No. 454. **Serpula ——.**

A very large and singularly twisted and ornamented specimen from the Upper Miocene beds of Asti, Piedmont. The original is in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 3. Price, $1.00.

No. 455. **Tentaculites elongatus,** Hall.

This fine specimen of the annulated shelly case of an ancient Palæozoic worm is from the Lower Helderberg (Upper Silurian) beds of Schoharie Co., N. Y. Price, $0.30.

THIRD SUB-KINGDOM.

MOLLUSCA.

This sub-kingdom ranks side by side with the preceding. The highest Molluscs are superior to the highest Articulates; while in both, the lowest are inferior to many Radiates. In Articulates, there is an advance manifested in the powers of locomotion and in the instincts; but in the Molluscs, the energies are expended chiefly in the perfection of those organs concerned in the immediate preservation of the individual and the species.

Molluscs have the centre of the nervous system scattered unsymmetrically (whence Owen's name of the Sub-kingdom—*Heterogangliata*); and this is often accompanied with an unsymmetrical form of the entire body. All have a complete alimentary canal, with mouth, stomach, intestine and vent; a liver, but no absorbent system; a chambered heart propelling a colorless blood through a system of arteries and veins; and either lungs or gills. They are hermaphrodite or bisexual, oviparous or viviparous. Two-thirds of the species are aquatic; many are exclusively oceanic, some are restricted to the brackish water of estuaries; others live only in fresh water; and some on land. Every region has its appropriate tribe; and so has each zone of depth in the sea, from the floating Pteropods to the Terebratulæ sometimes found at 100 fathoms. Deep water shells are mostly small, and have a wide range and high antiquity. As a general rule, the land Molluscs are biennial; the aquatic species, annual. In compensation for the low condition of the perceptive energies, the body of the Mollusc is commonly protected by one or more plates or shells, variously adjusted upon the soft parts of the animal.

Three-fourths of living species of Molluscs are univalves; the others are mostly bivalves. The bivalves are all aquatic. With rare exceptions, land, fresh water and littoral univalves have entire mouths and are

vegetarians; while in marine shells, the mouth is interrupted by a notch or prolonged into a canal, and the animal is carnivorous.

Molluscs are separable into the *Cephalous* and *Acephalous*. The former are nearly all univalves, and are subdivided, according to the modifications of the locomotive organs, into *Cephalopoda*, *Gasteropoda* and *Pteropoda*. Headless Molluscs are bivalves chiefly, and are divided into *Lamellibranchia* (or *Conchifera*), *Brachiopoda*, *Tunicata*, and *Bryozoa*.

The natural families of Molluscs now verging toward extinction, are the *Rhynchonellidæ*, *Trigoniadæ*, and *Nautilidæ*. The following have already passed away: *Productidæ*, *Orthidæ*, *Spiriferidæ*, *Hippuritidæ*, *Orthoceratidæ*, *Ammonitidæ* and *Belemnitidæ*. Lamellibranchs have superseded Brachiopods; and Gastropods vastly outnumber Cephalopods. The extinct families and genera attained their maximum more rapidly than their minimum.

The remains of shell-bearing Molluscs are the most common of all fossils, and afford the most complete series of "medals" for the identification of strata. The sub-kingdom started an unfolded type. All its grand divisions, even to the highest, are represented in the lowest rocks. Both the highest and lowest groups were most abundant in the Palæozoic age; the ordinary bivalves and univalves attain their climax in existing seas. Fossil shells number about three-fourths of living species—15,000: of these 500 are land, 800 fresh-water, and over 13,000 marine. They passed their culmination in the latter half of the Mesozoic age; but the largest number of species occur in the Miocene. The average duration of the marine species is one-third the length of a geological period, which accounts for the fact that so few have a world-wide distribution. The life of land and fresh-water shells is of longer average extent. Tertiary fresh-water shells are Old World forms; while Tertiary land-shells are American in character.

CLASS I.—CEPHALOPODA.

The Cephalopods are the most highly organized of Molluscs. We recognize elements which belong to the highest and lowest forms of life: the beak and complex eye, the tongue and ear, the crop and gizzard, the partial segmentation of the yolk, the Chameleon habit of changing color, the cartilages—an analogue of the spine—point to the Vertebrates; while the first draught of the pharyngeal ganglion is seen in the Rotifera, the sucker-bearing arms have their first outline in the Hydra, the phragmocone represents the calcareous axis of a coral, and if the mouth of the Cuttle-fish with its arms be separated from the head, we

have a picture of the Star-fish. Professor Owen has observed, moreover, that the tentacles of the Pearly Nautilus lead to the antennæ of Articulates. On account of these peculiarities, Vogt separates the the Cephalopods into a distinct primary division of the Animal Kingdom. Agassiz says it is easy to homologize all the systems of the organs with those of other Molluscs: the differences constitute only class charters and exhibit in no way a different phase.

Cephalodods are marine and carnivorous; nocturnal and social; oviparous and bisexual—the females being larger and more numerous than the males. The locomotive organs are attached to the head. Unlike most other Molluscs, they are symmetrical; and the shell is usually straight or coiled in a vertical plane, instead of being spiral as in the unsymmetrical Gastropods. The Nautilus and Argonaut alone of living tribes have external shells; the rest are naked.

Order I.—Dibranchiata.

The members of this Order, with the single exception of the Argonaut, have an internal shell which is sometimes called the skeleton, but has nothing to do with protecting the nervous centres. In lieu of an external covering, they have eight or ten powerful arms furnished with suckers, more perfect organs of vision, more vigorous circulation, and the power to secrete an inky fluid with which to cover their retreat. The Cuttle-fish is the largest of all animals not supported by a jointed skeleton. The Order first appeared in the Lias.

No. 456. Belemnites Owenii, Pratt.

Guard. The Belemnite is the most complicated of Cephalopod shells. The chambered part or *phragmocone* (represented by the terminal appendix of the Squid), is a straight attenuated cone with numerous septa, resembling a pile of watch-glasses, concave towards the base. The whole is enveloped in a sheath; and the two together are lodged in a conical cavity or alveolus excavated in the base of a long spathose body (corresponding to the *mucro* of the cuttle-bone), resembling the head of a javelin, whence the generic name. The exterior of this "guard," as it is called, has usually a longitudinal groove; and the septa of the phragmocone are perforated by a marginal siphuncle generally situated on the side nearest the groove; but in certain species, characterized by a flattened guard, the siphuncle is on the oppo site side. Besides these fossil parts, there have been found remains of the ink-bag, pen, mantle, fins, mandibles, arms and hooks. This specimen, now in the Ward Museum of the Uni versity of Rochester, is from the Oxford Clay (Upper Oolite), Christian Malford, England. The fractured upper portion shows the alveolar cavity with the phragmocone in place. Size, 6 x 2. Price, $0.60.

No. 457. **Belemnites Owenii,** Pratt.

Guard and phragmocone showing the nacreous surface. An unusually large and fine specimen. From the same locality as the preceding. Original in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 14 x 5. Price, $1.75.

No. 458. **Belemnites giganteus,** Schloth.

The *B. giganteus* (the *B. maximus* of Giebel), is chiefly remarkable for its great size. It belongs to D'Orbigny's group, *"Acuarii,"* characterized by a groove at the end only. This specimen is from the Middle Lias at Ehningen, Wirtemberg, and is in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 24 x 4. Price, $2.00.

No. 459. **Belemnites giganteus,** Schloth.

Phragmocone, showing the thin transverse plates dividing it into a series of narrow air-chambers gradually diminishing towards the apex. The phragmocone was evidently designed to adjust the specific gravity of the animal. The specimen is from the Lower Oolite, Wirtemberg. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 460. **Belemnites dilatatus,** Blainv.

Guard. This Belemnite has a compressed guard and the longitudinal furrow situated on the margin opposite to the siphuncle. The form is characteristic of the Neocomian beds. These specimens (three in number) are from the Lower Neocomian (Cretaceous), France, and belong to the Ward Museum, University of Rochester. Price, $0.75.

No. 461. **Belemnites acuarius,** Schloth.

This guard, distinguished by the want of lateral furrows, and by its extreme length and slenderness, was found in the Lias at Whitby, England. Original in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 13 x 1. Price, $0.50.

No. 462. **Belemnites lateralis,** Phillips.

Guard, from the Speeton Clay (Lower Cretaceous), Yorkshire, England. Original in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 6 x 2. Price, $0.50.

No. 463. **Beloteuthis subcostata,** Münst.

This flattened Belemnite receives its generic name from its supposed affinity to the living Squid. The osselet or rudimental shell, represented in this specimen, is broad and rounded at each end. It was found in the Lias at Holzmaden, Wirtemberg. Size, 6 x 3. Price, $0.60.

No. 464. **Teuthopsis oblonga,** Wagn.

The osselet of this Dibranchiate differs from that of the Squid in being narrower in front and larger in the posterior part. The specimen is from the Lithographic Limestone (Middle Oolite) at Solenhofen, Bavaria.

Size, 6 x 3. Price, $0.60.

No. 465. **Leptoteuthis gigas,** Meyer.

In this Calamary—the *Acanthoteuthis gigantea,* Münst.—the osselet is horny, slightly convex, truncate in front and pointed behind. The specimen is from the Lithographic Limestone (Middle Oolite), Solenhofen, Bavaria.

Size, 18 x 4. Price, $1.50.

No. 466. **Geoteuthis ——,** Münst.

An undescribed species. The osselet of this genus is characterized by a wide shaft, and is frequently accompanied by a well-preserved ink-bag. The specimen shows the muscular tissues of the body, fins and arms, with traces of the non-nacreous pen. It is from the Oxford Clay (Middle Oolite), Christian Malford, England, and is in the private Geological Cabinet of Mr. Ward, Rochester. Size, 10 x 4. Price, $1.50.

Order 2.—Tetrabranchiata.

The Tetrabranchs have numerous hollow arms with retractile tentacles, and a head retractile within an external shell. This shell is a long cone, straight, folded or coiled, and divided into chambers by a series of septa connected by a siphuncle which is central, ventral or dorsal. The animal lives in the outer chamber, but holds vital conection with the deserted rooms of its dwelling by means of the siphuncle. The exact function of the siphuncle is still unknown. Its action cannot be hydrostatic, for in the living Nautilus it is not dilatable. There is only one living Tetrabranch—the Nautilus; and this is one of the few genera which have existed at every period of the world's history. This Order came first and culminated as the more highly organized Cuttle-fishes made their appearance. The families of each Order which are most unlike (*Orthoceratidæ* and *Belemnitidæ*) were respectively the first developed. The four-gilled type began in the straight Orthoceras and half-coiled Lituite of the Silurian, maximized in the complex Ammonite of the Jurassic, and declined in the Cretaceous through the half coiled forms and the straight Baculite. The straight Tetrabranchs must have lived habitually in a nearly vertical position, while the discoidal genera would also creep over the sea-bed with their air-chambers above them.

Ammonitidæ.

This is the most remarkable family of Secondary Molluscs. Some twenty or more genera and nearly 1000 species have been identified. They range from the Devonian to the Chalk inclusive, becoming totally extinct at the close of the Reptilian Period. The family includes the following principal genera in the order of their appearance: *Goniatites*, *Ammonites* proper, *Ancyloceras* and *Helicoceras*, *Crioceras*, *Toxoceras*, *Scaphites*, *Hamites*, *Baculites* and *Ptychoceras*, and *Turrilites*. The type began in the discoidal *Goniatites*, culminated in the compactly coiled and elaborate *Ammonites*, and expired in the half uncoiled forms as *Scaphites*, the spiral *Turrilites*, and the straight *Baculites*.

This division of chambered shells is distinguished from the succeeding family by more varied and more highly ornamented forms, with crumpled septa, lobed sutures, and marginal siphuncle. Excepting the *Goniatites*, the family is peculiar to and co-extensive with, the secondary strata. *Ammonites* proper inhabited involute shells having undulating septa, lobed and foliated sutures, a dorsal siphuncle (ventral as regards the animal), and a small nucleus, the whorl being compact from the first. The pattern is constant in each species. The shells are most beautiful when of middle growth, the ornamental characters being less developed in the young and lost in the adult. According to D'Orbigny, the compressed specimens are males, and the inflated, females. Their fossil beaks (Rhyncholites) are claimed to have been lately discovered. The shell of the Ammonite is generally thinner and more delicate than that of the *Nautilus*; the partitions are consequently more complicated, and the ribs are adorned and strengthened with spines, tubercles and bosses. With few exceptions, those having the back keeled with a furrow on each side mark the Lias period; while those with sharp, square or round backs are Oolitic. Ammonites are comparatively rare in America, but abound in Europe, and they have been seen in Oolitic deposits on the Himmalayas, 16,200 feet above the sea. The Jurassic Ammonites were of far higher grade than the living *Nautilus*.

No. 467. **Ammonites armatus**, Sowerby.

This species is typical of Von Buch's Group "*Armati.*" From the Lower Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Price, $0.50.

No. 468. **Ammonites Aon,** Munst.

Bronn and Quenstedt consider this species allied to *Ceratites.* From the Upper Trias; St. Cassian, Austria, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 469. **Ammonites Astierianus,** D'Orb.

From the Neocomian (Lower Cretaceous), Escragnolles, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 470. **Ammonites athletus,** Phil.

From the Kelloway Rock (Middle Oolite), and now in the Ward Museum, University of Rochester. Price, $0.60.

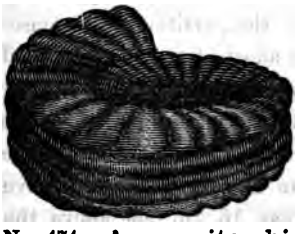
No. 471. **Ammonites bifrons,** Bruguiere.

(Syn. *A. Walcotii,* Sow.) This species is characteristic of the lower portion of the Upper Lias, and belongs to Von Buch's Group, "*Falciferi.*" The specimen is from Verpilliére (Isère), France, and is in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 7. Price, $1.00.

No. 472. **Ammonites Batesi,** Trask.

This fine American specimen is from the Cretaceous of California, Cotton Wood Creek, Shasta County, and belongs to the Ward Museum, University of Rochester. Diameter, 15. Price, $3.00.

No. 473. **Ammonites bisulcatus,** Brug.

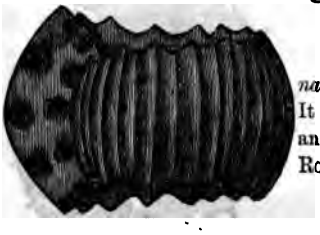


This Ammonite is frequently known by Sowerby's name of *A. Bucklandi.* It is the type of the group, "*Arietes.*" From the Lower Lias, Rautenberg, Brunswick, and now in the private Geological Cabinet of Mr. Ward, Rochester.
Diameter, 13. Price, $0.75.

No. 474. **Ammonites bisulcatus,** Brug.

From the Lower Lias, Wirtemberg, and now in the Ward Museum, University of Rochester. Diameter, 8. Price, $0.50.

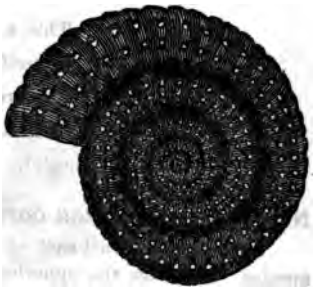
No. 475. **Ammonites Blagdeni,** Sow.



This fine specimen closely resembles *A. coronatus,* and belongs to the same group, "*Coronati.*" It is from the Lower Oolite, Dorsetshire, England, and now in the Ward Museum, University of Rochester. Diameter 7. Price, $1.50.

Macroderoceras?

No. 476. **Ammonites Birchii,** Sow.



This elegant form, with the outer markings of the shell visible upon all its whorls, and a double row of spines, belongs to the group "*Armati.*" It is from the Lower Lias, Charmouth, England, and belongs to the Ward Museum, University of Rochester.

Diameter, 8. Price, $1.25.

No. 477. **Ammonites Bechei,** Sow.

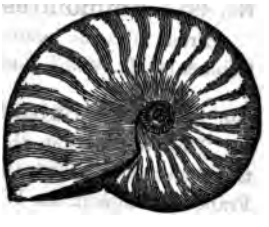
This species, closely related to *A. Henleyi,* Sow., is from the Middle Lias, Charmouth, England, and the specimen is in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 478. **Ammonites Brongniarti,** Sow.

This curiously inflated species is from the Lower Oolite, Yeovil, England, and is in the private Geological Cabinet of Mr. Ward, Rochester.

Diameter, 10. Price, $1.25.

No. 479. **Ammonites concavus,** Sow.



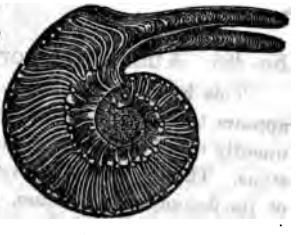
This species belongs to the group, "*Disci.*" From the Lower Oolite, Bridport, England, and now in the Ward Museum, University of Rochester.

Price, $0.70.

No. 480. **Ammonites communis,** Sow.

This species is characteristic of a zone near the base of the Upper Lias, in which it is associated with many closely allied forms, some of which at least are only varieties. The specimen is from Whitby, England, and is in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 481. **Ammonites Comptoni,** Pratt.



This species is closely allied to the well known *A. Jason,* but is distinguished from it by wanting the spines which ornament that species. Like it, it has long, narrow, lateral processes extending from the lip of the shell. It is associated with *A. Jason* in the Oxford Clay (Middle Oolite), Christian Malford, Eng. Price, $0.60.

No. 482. **Ammonites cordatus,** Sow.

This, a young shell, shows the cordate keel from which the specific term is derived, and which assigns the species to the group *"Amalthei."* From the Oxford Clay (Middle Oolite), and now in the Ward Museum, University of Rochester. Price, $0.25.

No. 483. **Ammonites cordatus,** Sow.

This is the internal cast of an unusually large specimen of this interesting species. It shows the spherical character of the very old form, and the great size of the last chamber. From the Middle Oolite of France.

Diameter, 11. Price, $2.00.

No. 484. **Ammonites cordatus,** Sow.

Internal cast of the adult shell showing the foliations. From the Oxford Clay (Middle Oolite), Calvados, France, and now in the Ward Museum, University of Rochester. Diameter, 7 Price, $0.80.

No. 485. **Ammonites cordatus,** Sow.

From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 486. **Ammonites coronatus,** Brug.

This species from the Middle Oolite, very much resembles *A. gigas,* Ziet. of the Upper Oolite. It is the type of Von Buch's group, *"Coronati."* From Villere, France, and now in the Ward Museum, University of Rochester. Price, $1.00.

No. 487. **Ammonites coronatus,** Brug.

Younger Shell. From the same locality and Museum as the preceding.

Price, $0.50.

No. 488. **Ammonites cornucopiæ,** D'Orb.

This elegant Ammonite very closely resembles *A. fimbriatus,* Sow., but is considered by D'Orbigny a distinct species. Its several whorls are coiled quite loosely and taper very rapidly towards the centre of the shell. From the Upper Lias, Verpilliére, France, and now in the Ward Museum, University of Rochester. Diameter, 12. Price, $2.50.

No. 489. **Ammonites crassus,** Phil.

This is one of the forms closely allied to the *A. communis,* from which it appears to differ chiefly in its greater thickness. Like the latter, it is very frequently found forming the central nucleus of discoid concretions of slaty limestone. These concretions owe their origin to the attracting and cementing power of the decomposing mollusc. From the Upper Lias, Whitby, England, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 490. **Ammonites fimbriatus,** Sow.

This species is characteristic of the group, "*Fimbriati.*" The specimen shows the ornamental characters of the external shell. From the Middle Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 491. **Ammonites fimbriatus,** Sow.

This specimen shows the internal layers of the shell, with the markings corresponding to those on the exterior. From the same locality as the preceding, and now in the Ward Museum, University of Rochester. Price, $1.00.

No. 492. **Ammonites gigas,** Zieten.

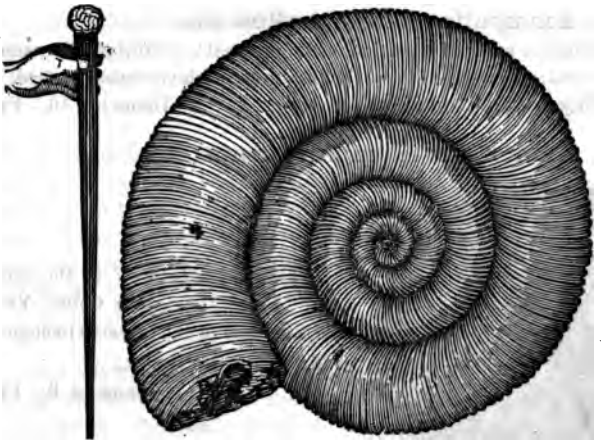
This species belongs to the group "*Coronati.*" From the Upper Oolite, Yonne, France. Diameter, 9. Price, $1.75.

No. 493. **Ammonites ——.**

This specimen of a species allied to *Ammonites gigas,* Ziet., shows foliations, septa and siphuncle, and is from the same location as the preceding, and now in the Ward Museum, University of Rochester. Diameter, 18. Price, $4.50.

No. 494. **Ammonites giganteus,** Sow.

This is assigned to the group, "*Planulati*" of Von Buch. From the Upper



Oolite, Isle of Portland, England. Diameter, 26. Price, $6.00.

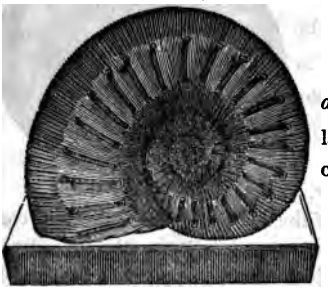
No. 495. **Ammonites Goliathus,** D'Orb.

On pedestal. This specimen, an inner cast of a species allied to the *A. modiolaris,* shows well the outer markings of the lobes and the floor of one of the septa. The original, from the Middle Oolite of Dives, France, is in the private Geological Cabinet of Mr. Ward, Rochester. Price, $1.00.

No. 496. **Ammonites Gowerianus,** Sow.

From the Kelloway Rock (Middle Oolite), England, and now in the Ward Museum of the University of Rochester. Price, $0.50.

No. 497. **Ammonites Henleyi,** Sow.



Pictet refers this to the group "*Macrocephali.*" From the Middle Lias, Charmouth, England, and now in the Ward Museum, University of Rochester. Diameter, 6. Price, $1.00.

No. 498. **Ammonites Herveyi,** Sow.

Probably the same as *A. macrocephalus*, Schloth. From the Oxford Clay (Middle Oolite), Wilts, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 499. **Ammonites heterophyllus,** Sow.

This specimen shows well the elegant and leaf-like foliations which characterize the group "*Heterophylli.*" It also shows the floor of one of the chambers, with the arrangements of the saddles and lobes. From the Upper Lias, Reutlingen, Wirtemberg, and is in the Ward Museum, University of Rochester.
Diameter, 7. Price, $1.00.

No. 500. **Ammonites heterophyllus,** Sow.

This specimen shows a portion of the internal layer (originally nacreous) overlying the foliations and retaining the markings of the exterior surface. From the same locality and Museum as the preceding. Diameter, 10. Price, $1.50.

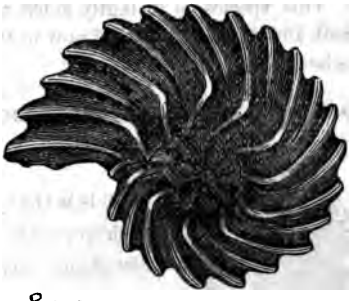
No. 501. **Ammonites Humphriesianus,** Sow.

This species belongs to the group "*Coronati.*" From the Lower Oolite, Yeovil, England, and now in the private Geological Cabinet of Mr. Ward, Rochester..
Diameter, 9. Price, $1.50.

No. 502. **Ammonites ——.**

This curious form from the arrangement of its whorls would appear to belong to the "*Bullati,*" but in its markings approaches to some of the varieties of *A. Humphriesianus*, Sow. From the Oolite of Calvados, France, and now in the Ward Museum, University of Rochester. Diameter, 6 in. Price, $1.00.

No. 503. **Ammonites interruptus,** Brug.



The varieties of this very variable form have been described under many different names, such as *A. Delucii*, Brong., *A. dentatus*, Sow., *A. Benettianus*, Sow., *A. serratus*, Sow. etc. From the Lower Cretaceous, St. Florentin, France, and now in the Ward Museum, University of Rochester.

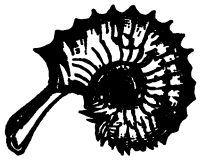
Price, $0.75.

No. 504. **Ammonites interruptus,** ~~Park.~~ Brug.

Variety, (*A. Delucii*, Brong.) From the Gault, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 505. **Ammonites Jason,** Reinecke.

This beautiful species belongs to the group "*Ornati*" of Von Buch. The specimens from the Oxford Clay of Christian Malford, England, where this was found, are compressed in the marl, but show well two lateral shelly processes developed on each side of the aperture. This feature is found in the young of many species of Ammonites, but is lost on their attaining the adult form. From the Ward Museum, University of Rochester. Price, $0.50.



No. 506. **Ammonites Kœnigi,** Sow.

This is a characteristic fossil of the Middle Oolite. It is from the Oxford Clay, Wiltshire, England, and is in the private Geological Cabinet of Mr. Ward. Rochester. Diameter, 7. Price, $1.00,

No. 507. **Ammonites laticostatus,** Sow.

This is most probably identical with *A. capricornus* of Schlotheim, and is very typical of the group "*Capricorni.*" In its adult stage, this species loses its characteristic form, and assumes one somewhat resembling *A. Buchii*, Sow. In this state it has received various synonyms, but it is best known as *A. heterogenus*, From the Middle Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 508. **Ammonites Leopoldinus,** D'Orb.

This is closely related to *A. radiatus*, Brug., and with that form belongs to Von Buch's group, "*Flexuosi.*" From the Lower Neocomian (Lower Cretaceous), Auxerre, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 6. Price, $0.75.

No. 509. **Ammonites linguiferus,** D'Orb.

This is an ally of *A. Humphriesianus*, Sow. From the Lower Oolite, Calvados, France, and now in the Ward Museum, University of Rochester.

Price, $0.75.

No. 510. **Ammonites Lyellii,** Laymerie.

This species is distantly allied to *A. Rhotomagensis,* Lamarck. From the Gault, Dienville, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.30.

No. 511. **Ammonites macrocephalus,** Schloth.

This is the type of Von Buch's group, "*Macrocephali*" which resemble the "*Coronati,*" but are ordinarily more inflated and have tubercles nearer the umbilicus. From the Middle Oolite, Wiltshire, England, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Diameter, 7. Price, $1.25.

No. 512. **Ammonites mammilatus,** Schloth.

From the Lower Cretaceous, of France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.30.

No. 513. **Ammonites Mantelli,** Sow.

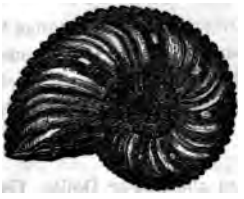
The Cretaceous Ammonites appear to have had such tendency to variation, that specific names have been needlessly multiplied, and thus this well-known Ammonite has been described under several synonyms. It belongs to the group, "*Rhotomagenses.*" From the Lower Chalk, St. Florentin, France, and now in the Ward Museum, University of Rochester.

Price, $0.75.

No. 514. **Ammonites ——.**

This is the inner cast of a gigantic species much resembling the *A. Mantelli* in its markings, but much compressed laterally. Diameter, 31. Price, $6.00.

No. 515. **Ammonites margaritatus,** Mumfort.



Synonym of *A. amaltheus,* Schloth., and type of group, "*Amalthei,*" of Von Buch, or Ammonites with cordate keels. This is an exceedingly variable species. From the Middle Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 7. Price, $0.75.

No. 516. **Ammonites margaritatus** Mum.

This is a young shell from the same locality and Cabinet as the preceding.

Price, $0.30.

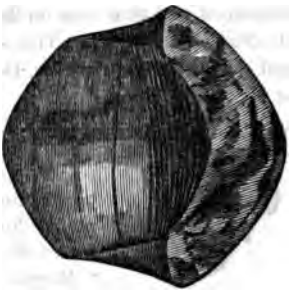
No. 517. **Ammonites Martinsii,** D'Orb.

From the Lower Oolite, Bridport, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 10in. Price, $1.50.

No. 518. **Ammonites Millesianus,** D'Orb.

From the Lower Chalk (Cretaceous), Rouen, France.
Diameter, 8. Price, $1.50.

No. 519. **Ammonites modiolaris,** Luid.



Also known as *A sublævis,* Sow. From the Kelloway Rock, Wiltshire, England, and now in the Ward Museum, University of Rochester. Price, $0.75.

No. 520. **Ammonites modiolaris,** Luid.

Young form, from the same locality and Museum. Price, $0.30.

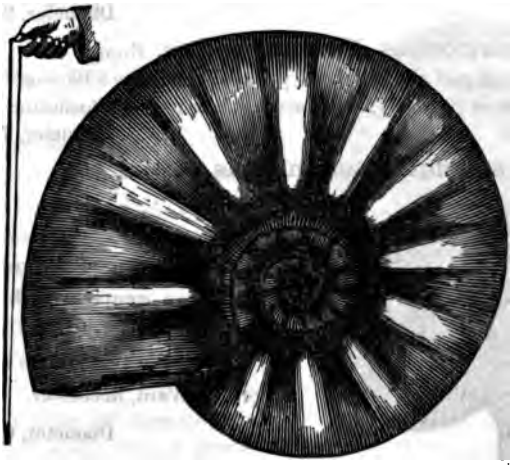
No. 521. **Ammonites obtusus,** Sow.

This Ammonite is well-known from the Lower Lias of England, where the casts of the interior, preserved in beautifully colored calc spar, are known as "Tortoise-shell Ammonites." It belongs to the group "*Arietes.*" This specimen is from the Lower Lias, Charmouth, England, and is now in the private Geological Cabinet of Mr, Ward, Rochester. Diameter 9. Price, $1.50.

No. 522. **Ammonites Parkinsoni,** Sow.

This shell, so characteristic of the inferior Oolite of Europe, probably belongs to the group "*Dentati,*" the head-quarters of which are in the Cretaceous series. From Bridport, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 523. **Ammonites peramplus,** Mant.



This gigantic specimen is from the Chalk, Germany, and is now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 31. Price: $6.00.

No. 524. **Ammonites perarmatus,** Sow.

From Oxford clay (Middle Oolite) Calvados, France, and in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 6. Price, $1.10

No. 525. **Ammonites planicostatus,** Sow.

This small form would appear to belong to the group "*Capricorni*," but as it increases in age, it assumes a single row of spines in some instances very largely developed, and thus puts on the character of the group "*Armati*" and becomes the *A. Dudressieri*, D'Orb. This specimen is a slab covered with numerous shells, and is from the Lower Lias, Dorset. It is now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter 12. Price, $1.50.

No. 526. **Ammonites refractus,** De Haan.

Two specimens on slab. This species is remarkable for the manner in which the last whorl loses the spiral and Ammonite-form arrangement, reminding us somewhat of a distorted *Scaphite*. It is probably an aberrant form of the group "*Macrocephali*." From theMiddle Oolite, Gammelshausen, Wirtemberg. Price, $0.40.

No. 527. **Ammonites radiatus,** Brug.

This form is the type of Von Buch's group "*Flexuosi*," the members of which belong to the Neocomian. From the lower Cretaceous, Auxerre, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 528. **Ammonites raricostatus,** Ziet.

From the Lower Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 529. **Ammonites Rhotomagensis,** Broug.

This is the type of the group "*Rhotomagenses*," the members of which are characterized by having a series of tubercles along the dorsal line in place of a keel. They belong chiefly to the Cretaceous period, From the Lower Chalk Rouen, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Diameter, 9. Price, $1.50.

No. 530. **Ammonites Rhotomagensis,** Brong.

An internal cast of part of one whorl showing the foliations. From the same locality, and now in the Ward museum, University of Rochester.

Diameter, 7. Price, $0.80.

No. 531. **Ammonites serpentinus,** Schloth.

This is the type of the group "*Falciferi*," which have a compressed shell with sharp keel. From the Upper Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Diameter, 6. Price, $0.80.

No. 532. **Ammonites serpentinus,** Schloth.

Compressed, on slab. From the Upper Lias, Boll, Wirtemberg, and now in the Ward Museum, University of Rochester. Diameter, 10. Price, $1.25.

No. 533. **Ammonites splendens,** Sow.

This specimen of this variable Ammonite appears to be intermediate between a type of this species and one of *A. auritus.* It is a characteristic fossil of the Gault (Cretaceous), Folkestone, England, and the specimen is now in the private Geological Cabinet af Mr. Ward, Rochester. Pirce, $0.60.

No. 534. **Ammonites Sowerbyi,** Miller.

This appears to be an aberrant and spinous form, belonging to the group "*Falciferi.*" From the Inferior Oolite, Bridport, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

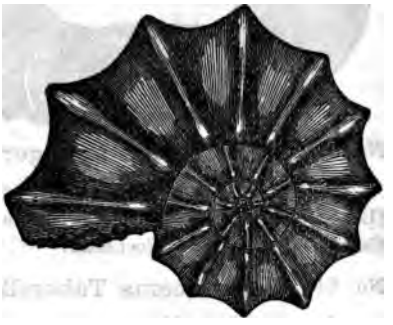
No. 535. **Ammonites tenuilobatus,** Oppel.

From the Middle Jurassic, Swabian Alps, Wirtemberg. Price, $0.40.

No. 536. **Ammonites Woollgari,** Mant.

This species is one of the most marked forms in the group "*Rhotomagenses.*" It has much resemblance to *A. Rhotomagensis,* particularly in the young stage; but differs from it by having less closely coiled whorls, and the ribs fewer, more salient, and more angular on either side of the dorsal plane.

Diameter, 9. Price, $1.50.



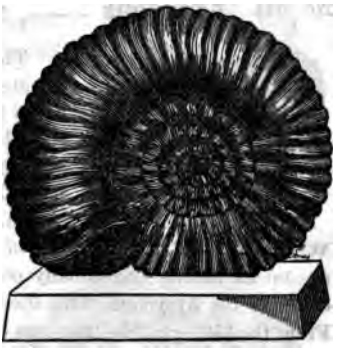
No 537. **Ammonites Woollgari,** Mant.

On pedestal, enlarged from the above. Diameter, 18. Price, $5.00.

No. 538. **Ammonites gigas,** Ziet.

This specimen is enlarged from No. 492. This and the preceding one are cast from artificial carvings, and are correct copies of the actual specimen in their general contour and linings. They are intended as mere ornamental pieces in a large Cabinet hall.

Diameter, 19. Price, $5.00.



Nos. 467–538. **Suite of Ammonites.**

The entire series enumerated above, comprises of 72 specimens, representing 58 species. Price, $75.00.

Omitting the five largest Ammonites—Nos. 494, 514, 523, 537, and 538, the series consists of 67 specimens with 55 species. Price, $50.00.

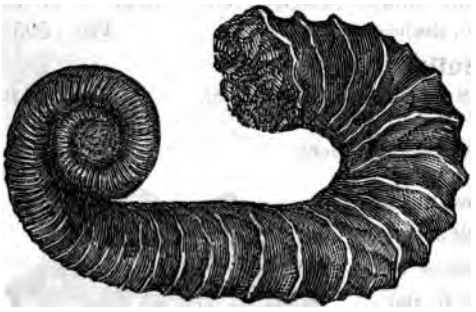
No. 539. **Ancyloceras Andouli,** Astier.

The Ancyloceras was like an Ammonite partly unrolled, having its inner whorls not touching and the outer one produced at a tangent and bent back again. From the Lower Greensand, Cheiron, France. Size, 13 x 6. Price, $1.50.

No. 540. **Ancyloceras Emerici,** D'Orb.

Portion lacking outer whorl. From the Upper Neocomian (Cretaceous), Barréme, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 7 x 9. Price, $1.75.

No. 541. **Ancyloceras gigas,** Sow.



This magnificent and perfect specimen (called by Sowerby, *Scaphites gigas,*) is from the Lower Greensand (Cretaceous), Atherfield, Isle of Wight, and is now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 18 x 12. Price, $3.50.

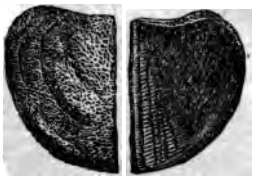
No. 542. **Ancyloceras spinigerum,** Sow.

Woodward gives this species as the type of the genus. From the Gault (Lower Cretaceous), Folkestone, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 543. **Ancyloceras Tabarelli,** Astier.

From the Upper Neocomian (Lower Cretaceous), Barréme, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 544. **Aptychus ——,** Meyer.



The Aptychi (*Trigonellites, Park,*) were described by Meyer as bivalve shells and by Deslongchamps under the name of *Munsteria.* D'Orbigny and Pictet regard them as *Cirripedes.* Deshayes considers them as the *gizzards* of Ammonites; Coquand compares them with *Teudopsis;* Ruppell, Voltz, Quenstedt, and Zieten, regard them as the opercula of Ammonites. Woodward and the majority of English Geologists are of this last opinion, specimens having occasionally occurred in which the aperture of the shell was closed by the Aptychus. This specimen consists of two pairs, showing both sides. From the Lithographic limestone (Middle Oolite), Solenhofen, Bavaria.

Price, $0.60.

No. 545. **Aptychus lamellosus,** Meyer.

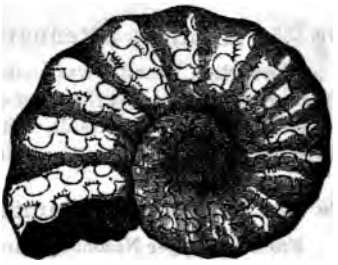
The inner surface of this species is marked by longitudinal striæ. The original specimen, from the Lithographic Limestone (Middle Oolite), of Solenhofen, Bavaria, is in the Ward Museum in the University of Rochester. Price, $0.40.

No. 546. **Baculites anceps,** Lam.

The Ammonitidæ, whose forms bave been gradually more and more unrolled as we ascend in the geological series, terminate in the Upper Chalk with this perfectly straight form. The shell of this fossil seems to have been very thin, and usually as in the present specimen, the cast of the chambers alone remains. The original, from the Upper Chalk of France, is in the Ward Museum of the University of Rochester.

Size, 10 x 3. Price, $1.12.

No. 547. **Ceratites nodosus,** De Haan.



This genus is distinguished by having the lobes of the sutures serrated while the intervening "saddles" are simple. This specimen is from the Muschelkalk (Trias), Luneville, France, and now in the Ward Museum, University of Rochester.

Size, 7 x 5. Price, $0.75.

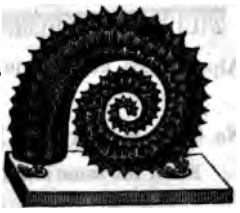
No. 548. **Ceratites nodosus,** De Haan.

From the same locality and Museum as the preceding. Price, $0.50.

No 549. **Ceratites Syriacus,** Von Buch.

This specimen, from the Cretaceous beds of Mount Lebanon, Syria, is in the Ward Museum in the University of Rochester. Price, $0.40.

No. 550. **Crioceras ——.**



On pedestal. The original of this specimen was brought by Humboldt from the Lower Cretaceous at Santa Fe de Bogota, S. A. Size, 12 x 10. Price, $8.00.

No. 551. **Crioceras bifurcatus,** Quenst.

From the Jurassic, Reutlingen, Wirtemberg. The original is in the private Geological Cabinet of Mr. Ward, Rochester, N. Y. Price, $0.75

No. 552. **Crioceras Duvalii,** Léveillé.

From the Lower Neocomian (Cretaceous), Escragnolles, France, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 11 x 8. Price, $1.50.

No. 553. **Goniatites expansus,** Vanuxem.

From the Goniatite limestone (Devonian), Manlius, N. Y.

Size, 9 x 7. Price, $1.00.

No. 554. **Goniatites ixion,** Hall.

From the Lower Carboniferous, Rockford, Indiana. The original of this fine, well-marked specimen is in the Ward Museum in the University of Rochester. Price, $0.50.

No. 555. **Hamites attenuatus,** Sow.

The shell of Hamites was hook-shaped or bent upon itself more than once; the courses separate, and the inner ones probably broke away in the progress of its growth. From the Gault, Folkestone, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 556. **Hamites (Hamulina) Astierianus,** D'Orb.

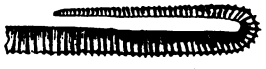
From the Upper Necomian Barrème, France, and now in the Ward Museum, University of Rochester. Size, 11 x 4. Price, $1.25.

No. 557. **Hamites (Hamulina) Astierianus,** D'Orb.

From the same locality as the preceding.

Size, 20 x 8. Price, $1.50.

No. 558. **Hamites (Hamulina) cinctus,** D'Orb.



The genus *Hamulina* was created by D'Orbigny to include the Neocomian *Hamites*. From the Upper Neocomian (Cretaceous), Barrème, Basses Alps, France, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 14 x 4. Price, $1.75.

No. 559. **Hamites (Hamulina) cinctus,** D'Orb.

From the same locality and Museum as the preceding.

Size, 10 x 4. Price, $1.50

No. 560. **Helicoceras rotundum,** Sow.

The whorls of this genus, when not distorted by pressure, are separate and spiral, not discoidal. From the Gault (Lower Cretaceous), Folkestone, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 561. **Scaphites binodosus,** Römer.

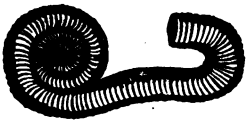
From the Upper Chalk, Haldem, Westphalia, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 562. **Scaphites aequalis,** Sow.

This large specimen of the species is from the Chloritic Chalk (Lower Cretaceous), Rouen, France.

Price, $0.25.

No. 563. **Scaphites Ivanii,** Puzos.



In this genus, the shell is first discoidal with close whorls, the last chamber detached and recurved. From the Lower Greensand, Barrème, France.

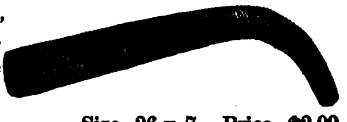
Price, $0.50.

No. 564. **Scaphites compressus,** Roem.

From the Upper Chalk, Haldem, Westphalia, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 565. **Toxoceras Moutonianum,** D'Orb.

The shell of this genus was bow-shaped, like an Ammonite uncoiled. This perfect specimen of a large individual is from the Lower Greensand, Escragnolles, France.



Size, 26 x 7. Price, $2.00.

No. 566. **Toxoceras obliquatum,** D'Orb.

From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 13 x 6. Price, $1.25.

No. 567. **Turrilites costatus,** Lamarck.

The eccentric spiral coiling of the shell in this genus is a feature peculiar to it among all the many and varied cephalopod forms, and gives it in external appearance not a little the look of a Gasteropod. From the Chalk Marl, Lower Cretaceous, Rouen, France, and now in the Ward Museum in the University of Rochester. Size, 6 x 3. Price, $0.80.

No. 568. **Turrilites polyplocus,** Römer.

This large specimen of the species is from the Chalk, Haldem, Westphalia, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 12 x 4. Price, $1.25.

Nautilidæ.

This family includes those chambered-shells having simple concave septa, smooth sutures and an internal, simple siphuncle. With the exception of *Nautilus* and *Aturia*, it is confined to the Palæozoic rocks

The first true *Nautilus* with regular spiral appeared in the Upper Silurian; and the nautiloid form has survived to the present day. The family culminated in the Carboniferous Age. The *Nautilus Pompilius* is one of the few representatives in the existing seas of that vast assemblage of chambered siphoniferous shells which swarmed in the Secondary and Palæozoic oceans.

No. 569. **Nautilus bidorsatus,** Schloth.

This species is marked by a broad shallow furrow following the course of the outer whorls, thus giving the shell a double back or keel. From the Muschelkalk (Trias), of Brunswick, Germany, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 7 x 5. Price, $1.25.

No. 570. **Nautilus elegans,** Sow.

This very characteristic species of the Lower Chalk is from Havre, France, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 10 x 9. Price, $2.25.

No. 571. **Nautilus intermedius,** Sow.

On pedestal. This huge form, with a deep umbilicus and capacious mouth, is from the Middle Lias, Charmouth, England, and now in the Ward Museum in the University of Rochester. Size, 12 x 9. Price, $2.75.

No. 572. **Nautilus latidorsatus,** D'Orb.

From the Upper Lias, Caen, Calvados, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 10 x 8. Price, $1.25.

No. 573. **Nautilus Neocomiensis,** D'Orb.

This specimen shows the shell with the sinuated markings that very generally characterize cretaceous species of this genus. From the Neocomian (Lower Cretaceous), Escragnolles, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $1.00.

No. 574. **Nautilus pseudo-elegans,** D'Orb.

This is closely allied to the preceding. It is an inner cast, and shows the septa of the shell. From the Chalk of Rouen, France, and now in the Ward Museum, University of Rochester.

Size, 6 x 5. Price, $1.00.

No. 575. **Nautilus semistriatus,** D'Orb.

This specimen shows the shell and the external markings from which the species takes its name. From the Middle Lias, Charmouth, England, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 6 x 5. Price, $1.00.

No. 576. **Nautilus semistriatus,** D'Orb.

From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 13 x 9. Price, $2.00.

No. 577. **Nautilus semistriatus,** D'Orb.

On pedestal. This is an unusually large specimen, with an expanded, trumpet-shaped mouth. From the same locality and Cabinet as the preceding.

Size, 15 x 10. Price, $3.25.

No. 578. **Nautilus ——.**

From the Middle Lias, Charmouth, Eng., and now in the Ward Museum, University of Rochester. Price, $0.75.

No. 579. **Nautilus ——.**

An interesting form, very slightly coiled. From the Carboniferous (?) strata of Kentucky, and now in the Ward Museum of the University of Rochester.

Diameter, 6. Price, $1.00.

No. 580. **Lituites undatus** Conrad.

This rare and remarkable shell is a Palæozoic ally of the *Nautilus*, from which genus it differs mainly by the complete exposure of all its whorls. From the Black River limestone (Lower Silurian), Middleville, N. Y.

Price, $0.75.

No. 581. **Trocholites ammonius,** Hall.

This nautiloid shell is from the Black River limestone (Lower Silurian), Middleville, N. Y. Price, $0.20.

No. 582. **Discites ornatus,** Hall.

From the Goniatite limestone (Devonian), Manlius, N. Y.

Size, 7 x 5. Price, $1.00.

No. 583. **Rhyncholites Gaillardoti,** Faure-Biguet.

This species of Rhyncholite is suggested by Woodward to have been a mandible of *N. arietis*, Rein. Similar rhyncholites are found in all strata in which *Nautili* occur. Schlotheim described this species as a *Lepas;* Blainville, as the beak (!) of a Brachiopod; and D'Orbigny has manufactured two genera of Calamaries out of these fossils. These specimens, four in number, are from the Muschelkalk (Trias), Bavaria. Originals in the Ward Museum, University of Rochester. Price, $0.30.

Orthoceratidæ.

These Cephalopods were the princes of Molluscs in the Palæozoic times. They resemble in general uncoiled *Nautili*, being conical shells divided by simple septa, concave next the outlet. The siphuncle is usually central, but sometimes marginal, and always complicated. The shell is sometimes curved, but never compactly coiled as in the *Nautili*; and the animal was probably unable to withdraw itself into the shell—the body-chamber being relatively smaller than that of the *Nautili*. The shell, however, was essentially external. These Tetrabranchs were the most abundant and wide-spread molluscs of the old rocks, and attained a larger size than any other fossil shell. They were probably the chief agents in performing the duties allotted to the marine Carnivora. The New York specimens are most numerous in the Trenton Limestone. Those with a large siphuncle are wanting in England, France, Ireland, and Bohemia, but abound in America, Russia, and Sweden.

No. 584. **Orthoceras Titan,** Hall.

It was with this entirely straight, staff-like form that the family of the *Orthoceratidæ* made its first appearance on our globe. In this feature they present a picture quite the converse of the *Ammonitidæ*, which began with the tightly coiled forms, and closed with the straight *Baculites*. Some individuals of this genus grew to an immense size, and their movement in the water would have been extremely slow and cumbrous, but for the many air-chambers which buoyed and floated their shell. This gigantic specimen shows the last chamber, the greatest diameter of which is over eight inches; and the length of the entire original must have been about nineteen feet! From the Trenton limestone (Lower Silurian), Lowville, New York.

Size of slab, 9 ft. x 1 ft. 1 in. Price, $10.00.

No. 585. **Orthoceras amplicameratum,** Hall.

On slab. This handsome specimen from the Trenton limestone (Lower Silurian) of Middleville, N. Y., shows the entire length of the last chambers, with faint traces of the mouth. The shell being gone, the chambers of the posterior portion are visible. The original is now in the Ward Museum, University of Rochester. Size, 9 x 4. Price, $1.00.

No. 586. **Orthoceras crebrum,** Sæmann.

From the Middle Devonian, Eifel, Rhine Valley, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 587. **Orthoceras inequale,** Barr.

This species of a very much attenuated form is from the Upper Silurian, Batowitz, Bohemia, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 13 x 3. Price, $1.25.

No. 588. **Orthoceras pseudo-calamiteum,** Barr.

This is a neat, ornamental form, in which the outer shell with its peculiar markings is preserved. From the Upper Silurian, Kronieprus, Bohemia, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.25.

No. 589. **Ormoceras tenuifilum,** Hall.

Two specimens. This sub-genus of *Orthoceras* includes those forms which have the siphuncular beads constricted in the middle. These specimens are sections showing septa. From the Black River limestone (Lower Silurian), Watertown, NewYork. Size, 6 x 3. Price, $1.00.

No. 590. **Endoceras proteiforme,** Hall.

This sub-genus has a large siphuncle, mostly lateral or eccentric, marked or ridged on the outer surface by the septa. Within the siphuncle are one or more very elongated conical tubes, often one within another, as shown in the present specimen. From the Trenton limestone (Lower Silurian), Middleville, N. Y. Size, 12 x 3. Price, $1.50.

No. 591. **Gonioceras anceps,** Hall.

This specimen is a section showing wavy lines of septa. From the Black River limestone (Lower Silurian), Watertown, N. Y. Size, 6 x 4. Price, $0.75.

No. 592. **Gomphoceras inflatum,** Quenst.

This genus is characterized by an abrupt tapering or contraction of the last chamber towards the mouth; which latter is frequently of a very sinuate and irregular form. This specimen, which shows the septa and the last chamber, is from the Middle Devonian of the Eifel, Rhine Valley, and is now in the Ward Museum of the University of Rochester. Price, $0.50.

No. 593. **Gomphoceras serinium,** Hall.

From the Niagara Group (Upper Silurian), near Chicago, Ill. Price, $0.30.

No. 594. **Oncoceras orcas,** Hall.

This genus is distinguished by its curved, club-shaped form; the siphuncle is dorsal, and the aperture of the shell small. From the Niagara limestone (Upper Silurian), Racine, Wisconsin. Size, 6 x 2. Price, $0.60.

No. 595. **Phragmoceras maximum,** Conrad.

In this genus the shell is more tightly coiled than in any of the preceding *Orthoceratidæ*. This species—the largest one known—is from the Hamilton Group (Devonian) of Madison Co., N. Y. Diameter, 14. Price, $2.25.

No. 596. **Phragmoceras nestor,** Hall.

From the Niagara Group (Upper Silurian), Wauwatosa, Wis. Price, $0.50.

No. 597. **Phragmoceras subvenitricosum,** D'Archiac and DeVerneuil.

From the Middle Devonian of the Eifel, Rhine Valley. Original in the Ward Museum of the University of Rochester. Price, $0.75.

No. 598. **Cyrtoceras macrostomum,** Hall.

This slightly incurved shell is from the Trenton limestone (Lower Silurian), Mineral Point, Wisconsin. Price, $0.40.

No. 599. **Cyrtoceras corbulatum,** Barrande.

Two specimens. A form with singularly plaited and abundant septa from the Upper Silurian of Bohemia. Original in the Ward Museum of the University of Rochester. Price, $0.60.

No. 600. **Cyrtoceras elongatum,** Barrande.

An elegant form from the Upper Silurian of Beraun, Bohemia. The original is in the Ward Museum of the University of Rochester. Price, $0.50.

No. 601. **Cyrtoceras eugenium,** Hall.

This perfect specimen is from the Schoharie Grit (Devonian), Schoharie Co., New York. Size, 7 x 2. Price, $0.65.

No. 602. **Gyroceras trivolvis,** Conrad.

From the Upper Helderberg (Devonian) of Schoharie Co., N. Y. Diameter, 6. Price, $1.50.

No. 603. **Gyroceras Burlingtonense,** Owen.

In this, the most Nautiloid form of the *Orthoceratidæ*, the whorls of the shell nearly touch. From the Lower Carboniferous Limestone of Burlington, Iowa. Diameter, 15. Price, $2.25.

No. 604. **Gyroceras expansum,** Sæmann.

From the Hamilton Group (Devonian), Cazenovia, New York. Price, $0.85.

No. 605. **Gyroceras Eifelense,** D'Archiac.

From the Devonian of the Eifel, Rhine Valley. The original is in the Ward Museum of the University of Rochester.

Price, $0.40.

No. 606. **Gyroceras nereum,** Hall.

From the Corniferous Limestone (Devonian), Auburn, N. Y. Price, $0.75.

No. 607. **Gyroceras undulatum,** Vanuxem.

This shell is nautiloid; whorls separate; and the siphuncle, eccentric and radiated. This perfect specimen, with free coils, beautifully exemplifies the genus. From the Corniferous limestone (Devonian), Schoharie Co, New York.

Price, $0.75.

CLASS II.—GASTEROPODA.

These "belly-footed" Molluscs are the types of the Sub-kingdom. They make less approach to the Fishes than the Cephalopods, and less to the Crustaceans and Zoöphytes than Bivalves. The characteristic mode of locomotion is exemplified by the common Snail, which crawls by the alternate expansion and contraction of its foot. Gastropods are terrestrial or aquatic; bisexual or hermaphrodite; oviparous or ovo-viviparous. The body is generally unsymmetrical; and, with few exceptions, the visceral part is coiled up in a shell usually spiral and univalve. The apex of the cone (save in the Nucleobranchs,) is always oblique and eccentric: this departure from a perfect spiral is owing to the unequal development of the two sides of the animal. The spirals are right-handed; rarely otherwise. No shell is multilocular like the Ammonites. The muscular impression is crescent-shaped. The operculum is equivalent to the dextral valve of Lamellibranchs.

The Class is divided into four Orders, distinguished chiefly by the form and position of the lungs. The living species have a world-wide range, inhabiting the bottom and surface of the sea, sea shore, fresh water and dry land; 8,000 are vegetable-feeders; 5,000, animal-feeders. The fossil species number over 9,000. They are found in every fossiliferous rock, except the "Lingula flags." Those which first appear in the Palæozoic strata have entire mouths; the siphonated species are not found lower than the Lias, and they go on increasing in number in and from the Tertiary series to actual sea shores. The remains of Gastropods are highly important to the Geologist, as they afford him unequivocal evidence of the terrestrial, fluviatile, lacustrine or marine condition under which strata were formed.

No. 608. **Rostellaria carinata,** Mant.

This genus, by nearly twenty times more abundant in former geological times than in our own, was represented during the Cretaceous period by some very extreme forms, of which the present specimen is one. From the Gault, Folkestone, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 609. **Pyrula melongena,** Gratioloup.

A fine specimen from the Miocene Tertiary, Saucats, France, and now in the Ward Museum, University of Rochester. Price, $1.00.

No. 610. **Fusus antiquus,** Müller.

(Var. *contrarius,* Sow.) An interesting, reversed form, and a very characteristic shell of the Red Crag (Pliocene Tertiary), Norfolk, England. Original in the Ward Museum, University of Rochester. Price, $0.60.

No. 611. **Fusus longævus,** Lam.

From the Middle Eocene (Tertiary), Bracklesham, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75

No. 612. **Natica pelops,** D'Orb.

From the Upper Lias, LaVerpillière, France, and now in the Ward Museum, University of Rochester. Price, $0.30.

No. 613. **Naticella tubicina,** Barrande.

This specimen was taken from the Lower Silurian, at Butowick, Bohemia, and is in the Ward Museum of the University of Rochester. Price, $0.35.

No. 614. **Chemnitzia (Phasianella) Saemanni,** Oppel.

From the Inferior Oolite, France, and in the same Museum as the above. Price, $0.75.

No. 615. **Loxonema desiderata,** Hall.

From the Corniferous limestone (Devonian), Falls of Ohio. Price, $0.20.

No. 616. **Macrocheilus arculatus,** Phillips.

This type of the genus is from the Devonian, Eifel, Rhenish Prussia, and is in the Ward Museum, University of Rochester. Price, $1.30.

No. 617. **Macrocheilus primogenius,** Conrad.
From the Coal Measures, Graysville, Ill. Price, $0.20.

No. 618. **Cerithium giganteum,** Lam.

On pedestal. This genus, which abounded in Geological periods from the Trias to the present time, was distributed widely then as now in the seas over all parts of the globe. It had its culmination in numbers, as well as in size of individuals and variety of forms, during the Tertiary Period. This magnificent specimen—the largest of all fossil Gastropods—is from the Eocene Tertiary at Damery, France, and now in the private Geological Cabinet of Mr. Ward, Rochester.
Size, 22x7. Price, $2.75.

No. 619. **Cerithium giganteum,** Lam.
From the same locality as the preceding. Size, 13 x 4. Price, $1.75.

No. 620. **Cerithium giganteum,** Lam.
Internal cast. From the Eocene Tertiary, Vaugirard, France, Size, 7 x 3. Price, $1.00.

No. 621. **Cerithium cornucopiæ,** Sow.
From the Eocene Tertiary, Cotentin, France, and now in the Ward Museum, University of Rochester. Size, 8 x 3. Price, $1.50.

No 622. **Euomphalus pentangulatus,** Sow.

This genus, now entirely extinct, was present in considerable numbers in the Palæozoic seas, from the Lower Silurian to the Trias. Its discoidal form, angular whorls, and large umbilicus, make it a shell easily recognizable, and a servicable fossil in the determination of the age of strata in which it occurs. This specimen—from the Carboniferous limestone of Kildare, Ireland,—is now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 623. **Euomphalus cyclostomus,** Hall.
Two specimens, front and reverse. From the Hamilton group (Devonian), New Buffalo, Iowa. Price, $0.30.

No. 624. **Euomphalus rugosus,** Sow.
From the Upper Silurian, Dudley, England, and in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.30.

No. 625. **Euomphalus,** ——.
A very gibbous and slightly umbilicated form. From Carboniferous strata, in Australia. Now in the Ward Museum of the University of Rochester.
Price, $0.30.

No. 626. **Platyostoma ventricosum,** Conrad.
From the Oriskany sandstone (Devonian), Albany Co., N. Y. Price, $0.75.

No. 627. **Pleurotomaria armata,** Mant.
From the Inferior Oolite, Bayeux, France. Price, $0.50.

No. 628. **Pleurotomaria ornata,** Defrance.

This species takes its name from the row of tubercles which crowns its spiral whorls. From the Inferior Oolite of Calvados, France, and now in the Ward Museum, University of Rochester. Price, $0.50.

No. 629. **Pleurotomaria lenticularius,** Sow.
From the Trenton limestone (Lower Silurian), Watertown, N. Y. Price, $0.25.

No. 630. **Pleurotomaria Lucina,** Hall.
From the Corniferous limestone (Devonian), Clarence, Onondaga Co., N. Y. Price, $0.30.

No. 631. **Pleurotomaria tabulata,** Conrad.
From the Coal Measures, Graysville, Ill. Price, $0.30.

No. 632. **Murchisonia bellacincta,** Hall.

This Haliotid is from the Trenton limestone (Lower Silurian), Middleville, N. Y. Price, $0.30.

No. 633. **Capulus elegans,** Barr.
From the Upper Silurian, Bohemia, and now in the Ward Museum, University of Rochester. Price, $0.30.

No. 634. **Capulus robustus,** Barr.
From the Upper Silurian, Zochkow, Bohemia, and now in the same Museum as the preceding. Price, $0.25.

No. 635. **Platyceras ventricosum,** Conrad.
From the Lower Helderberg (Upper Silurian), Hudson, N. Y. Price, $0.60.

No. 636. **Platyceras nodosum,** Conrad.
From the Oriskany sandstone (Devonian), Albany Co., N. Y. Price, $0.75.

No. 637. **Dentalium Noe,** Bonelli.
From the Older Pliocene, Astezan, Piedmont, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.30.

No. 638. **Porcellia crassinoda,** White and Whitfield.
This shell much resembling some of the coiled cephalopoda in external form, is from the Chemung group (Devonian), Burlington, Iowa. Price, $0.60.

No. 639. **Bellerophon bicarinatus,** Leveille.
This type-species of this well-marked genus is from the Carboniferous limestone of Tournay, Belgium, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.20.

No. 640. **Bucania Chicagoensis,** McChesney.
This species, allied to *Bellerophon*, is from the Niagara limestone (Upper Silurian), Cook Co., Ill. Price, $0.50.

No. 641. **Bucania expansa,** Hall.

This loosely coiled, trumpet-mouthed shell is from the Trenton Limestone (Lower Silurian) of Watertown, N. Y.

Price, $0.40.

No. 642. **Strophostylus cyclostomus,** Hall.
From the Niagara limestone (Upper Silurian), Waldron, Ind. Price, $0.25.

No. 643. **Trails of Gasteropoda,**
From the Clinton group (Upper Silurian), New Hartford, N. Y. Price, $0.60.

CLASS III.—PTEROPODA.

These small Cephalous Molluscs are so called from the resemblance of their chief organs of motion to a pair of wings. They are either naked, or provided with a delicate translucent shell. In their first stages, they exactly resemble the Gastropod fry; and accordingly Lamarck, De Blainville and Owen regard them as a sub-class of the Crawlers, but Cuvier, Woodward, and Jones give them a higher rank. The active *Clio* (the food of whales and sea-birds) has its head armed with 360,000 microscopic suckers—a prehensile apparatus perhaps unequalled elsewhere in creation. The shell, when existing, resembles either a univalve or a bivalve in which the two valves have been cemented along the hinge. These "sea-butterflies," as they have been called, float in mid-ocean in every latitude, forever out of sight of land.

There are 32 fossil species,—all from the Tertiary, excepting the gigantic *Theca*, and *Conularia*, which are Silurian.

No. 644. **Conularia undulata,** Conrad.

The *Conularia* are commonly referred to this Class; but their large, thin, pyramidal shells, chambered at the apex and admitting of some motion at the angles above, present some of the distinctive features of Cephalopods. If really pteropodous, they were the giants of the Class. The angles of the Conularia are grooved, and the sides are striated transversely. This specimen is from the Hamilton group (Devonian), Cazenovia, N. Y.

Price, $0.40.

No. 645. **Conularia ——.**
From the Upper Silurian of Bohemia, and now in the Ward Museum, University of Rochester. Price, $0.60.

CLASS IV.—LAMELLIBRANCHIATA.

These ordinary, leaf-gilled bivalves are generally free and locomotive;—a few, as the Oyster, are fixed. They are mostly equivalve (the exceptions occurring in the stationary species), and always unequilateral. Each valve is a cone—of every grade from a flat plate to a spiral—, and the valves are articulated by teeth and a ligament, and also attached to each other by one or two muscles. The animal lives by filtering water through its gills, which are distinct from the mantle. Nearly all have a muscular foot developed from the ventral surface The Lamellibranchs, according to Agassiz, differ from the Brachiopods only in "secondary modifications." They do not readily group themselves into natural orders: the similarity of type is great, and the points of difference are not constant. The *Veneridæ* are the typical and most highly organized Lamellibranchs.

These bivalves, though less numerous now specifically, are far more abundant individually, than the Gastropods. They are all marine, excepting a few widely dispersed fresh-water genera (10 out of 90), and are found on every coast and in every climate, and from low water to the depth of 200 fathoms. The fossil forms constitute a third part of fossil shells. The genera are seven times more numerous in the newer Tertiary than in the Cambrian; while there are 800 species in the Miocene, and only 100 in the entire Silurian series. Of 49 from the Lower Silurian of New York, 26 are restricted to the Trenton Limestone.

No. 646. **Ostrea Marshii,** Sow.

This and the eight following forms belong to the family *Ostreidæ*, being unequivalved and unequilateral, and having one muscular impression. From the Lias, Geislingen, Wirtemberg, and now in the Ward Museum, University of Rochester. Price, $0.80.

No. 647. **Ostrea frons,** Parkinson.

From the Lower Chalk, Royan, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Two specimens. Price, $1.00.

No. 648. **Ostrea Santonensis,** D'Orb.

From the same locality as the preceding, and now in the Ward Museum, University of Rochester. Size, 6 x 4. Price, $0.80.

No. 649. **Ostrea Santonensis,** D'Orb.

From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $1.00.

No. 650. **Gryphea arcuata,** Lam.

From the Lias, Semur, France, and now in the Ward Museum, University of Rochester. Two specimens. Price, $0.60.

No. 651. **Exogyra columba,** Goldf.

From the Lower Cretaceous, Boussa, France, and now in the Ward Museum, University of Rochester. Price, $0.60.

NO. 652. **Exogyra costata,** Morton.

From the Cretaceous beds of Perry Co., Alabama, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 653. **Janira Neocomiensis,** D'Orb.

From the Lower Neocomian (Cretaceous), Auxerre, France, and now in the Ward Museum, University of Rochester. On slab. Price, $0.40,

No. 654. **Lima gigantea,** Sow.

From the Lias, Lyme-Regis, England, and now in the Ward Museum, University of Rochester. Price, $0.60.

No. 655. **Hippurites radiosa,** Desmoulins.

The *Hippuritidæ*, to which family this and the six succeeding forms belong, are (says Woodward), the most problematic of all fossils. They are characteristic of the cretaceous strata, and have an unequivalved, unsymmetrical shell, with two muscular impressions. This specimen, showing both valves, is from the Lower Chalk, Dordogne, France, and is now in the Ward Museum, University of Rochester.

Size, 6 x 4. Price, $1.50.

No. 656. **Hippurites radiosa,** Desm.

Lower value. From the same locality as the preceding. Price, $0.80.

No. 657. **Radiolites (Sphœrulites) Hœninghausii,** Desm.

From the Lower Chalk, Dordogne, France, and now in the Ward Museum, University of Rochester. Price, $0.75.

No. 658. **Radiolites (Sphœrulites) crateriformis,** D'Orb.

Lower valve. From the Lower Chalk, Royan, France, and now in the Ward Museum, University of Rochester. Size, 6 x 6. Price, $1.50.

No. 659. **Radiolites (Sphœrulites) crateriformis,** D'Orb.

Lower valve. This specimen shows the peculiar form of growth which this shell undergoes, the whole organism being much modified—from the normal bivalve construction—by its sessile character and its permanent attachment to the rock on which its station was chosen in an early period of its development. This lower valve shows the several lines of its foliaceous growth, as also the "birostre," or internal mould, still filling the central cavity. From the same locality and Museum as the preceding. Size, 6 x 6. Price, $1.50.

No. 660. **Sphærulites Bournoni,** Desm.

Both valves, with longitudinal section. From the Lower Chalk, Dordogne, France. Size, 10 x 6. Price, $2.25.

No. 661. **Sphærulites calceoloides,** Desm.

Both valves; the upper one showing its very peculiar projecting hinge-processes. From the same locality as the preceding. Size, 11 x 6. Price, $2.00.

No. 662. **Caprina adversa,** D'Orb.

This specimen of this most singular genus has both valves present, one of them very large, elongate and sinistrally coiled, the other so short and stunted as to resemble more the over-grown operculum of some Gasteropod shell. From the Lower Chalk of Charente, France. Size, 9 x 7. Price, $2.25.

No. 663. **Caprina adversa,** D'Orb.

Another equally perfect specimen of the above, but with the lower valve wanting. From the same locality as the preceding, and now in the Ward Museum of the University of Rochester. Size, 8 x 6. Price, $1.75.

No. 664. **Avicula flabella,** Conrad,

This and the five following belong to the *Aviculidæ* or "Wing-shells," a family characterized by a very oblique, unequivalved shell with a large posterior muscular impression, long, straight hinge-line, and eared umbones. From the Hamilton group (Devonian), Onondaga Co., N. Y. Price, $0.80.

No. 667. **Gervillia anceps,** Deshayes.

A characteristic bivalve fossil from the Lower Greensand of Atherfeld, Isle of Wight, England. Now in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 8 x 2. Price, $0.60.

No, 668. **Ambonychia radiata,** Hall.

From the Hudson River group (Lower Silurian), Cincinnati, Ohio.

Price, $0.20.

No. 669. **Inoceramus Cuvieri,** Sow.

From the Chalk, Bridlington, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 670. **Pterinea radians,** Conrad.

From the Hamilton group (Devonian), Cazenovia, N. Y. Price, $0.50.

No. 671. **Posidonia alveata,** Conrad.

From the Hamilton group (Devonian), Sherburne, N. Y. Price, $0.50.

No. 672. **Megambona cordiformis,** Hall.

From the Corniferous limestone (Devonian), Clarence, N. Y. Price, $0.40.

No. 673. **Megalodon cucullatus,** Sow.

This and the three following belong to the family *Cyprinidæ*, characterized by a somewhat regular, ovoid, equivalve shell, with from one to three cardinal teeth and two muscular impressions. From the Lower Devonian, Cologne, Rhenish Prussia, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Price, $0.35.

No. 674. **Cypricardia recurva,** Conrad

This specimen is from the Hamilton group (Devonian), Schoharie Co., N. Y. Price, $0.40.

No. 675. **Hippopodium ponderosum,** Sow.

This characteristic fossil of the English Lias was found in the Lower Lias, Cheltenham, England, and is now in the Ward Museum, University of Rochester. Price, $0.50.

No. 676. **Cypricardites alta,** Conrad.

From the Hamilton group (Devonian), Cayuga Lake, N. Y. Price, $0.35.

No. 677. **Microdon bellastriata,** Conrad.

This beautiful shell, much resembling *Tellina*, is from the Hamilton Group, (Devonian), Ontario Co., New York. Price, $0.20.

No. 678. **Anodonta ——.**

Group on slab. These toothless fresh-water mussels are from the Miocene Tertiary, of Ulm, Bavaria, and now in the Ward Museum, University of Rochester. Size, 6 x 4. Price, $1.00.

No. 679. **Trigonia costata,** Park.

This and the next three forms belong to the *Trigoniadæ*, the shell of which is equivalve and trigonal, with the umbones directed posteriorly. From the Lower Oolite, Œschingen, Wirtemberg, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 680. **Trigonia clavellata,** Sow.

From the Oxford Clay (Middle Oolite), Dives, France, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.75.

No. 681. **Trigonia caudata,** Agass.

A species with high smooth ribs, from the Lower Greensand of the Isle of Wight, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 682. **Trigonia crenulata,** Lam.

From the Lower Chalk of Rouen, France, and now in the Ward Museum of the University of Rochester. Price, $0.35.

No. 683. **Modiola plicata,** Sow.

This and the two following are "Mussels" (*Mytilidæ*), having an elongated, equivalve shell, with anterior umbones, edentulous hinge, and two muscular impressions. These two specimens (on pedestal) of *M. plicata* are from the Lower Oolite, Rendcomb, England, and are now in the Ward Museum, University of Rochester, Size, 6 x 4. Price, $0.80.

No. 684. **Orthonota undulata,** Conrad.

From the Hamilton group (Devonian), Summit, Schoharie Co., New York. Price, $0.30.

No. 685. **Congeria (Dreissena) subglobosa,** Partsch.

This is a very characteristic, globose and finely modelled form of bivalve shell. It abounds in the "Tegel," or sandy loam (MioceneTertiary) of Brunn, Austria, and now in the Ward Museum, in the University of Rochester. Price, $0.50.

No. 686. **Thracia ——.**

This and the following belong to the *Anatinidæ*. This species is from the Cretaceous of Egypt, and is now in the Ward Museum, University of Rochester. Price, $0.50.

No. 687. **Grammysia Hamiltonensis,** Verneuil.

From the Hamilton Group (Devonian), Cazenovia, N. Y. Price, $0.30.

No. 688. **Panopæa Faujassi,** D'Orb.

This Lamellibranch, belonging to the *Myaeidæ*, is from the Pliocene Tertiary, Leghorn, Tuscany, and is now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 4. Price, $0.80.

No. 689. **Teredina personata,** Lam.

These Pholads (three specimens on pedestal) are from the Eocene Tertiary, Mont Bernon, France. Price, $0.60.

CLASS V.—BRACHIOPODA.

These headless Molluscs are inclosed in bivalved shells, which are symmetrical in form, and equal on either side of a vertical line let fall from the beak, while the valves are almost always unequal. The larger one is called the ventral, and the smaller the dorsal. While in the Lamellibranchs, one valve is applied to the right side and the other to the left side of the animal; in this class, one valve is applied to the back, the other to the belly of the animal. The ventral valve has generally a prominent notched or perforated beak, through which, in most, a pedicle or byssus passes to attach the animal to some foreign body, for Brachiopods are deprived of the power of locomotion. The one or two accessory pieces occupying a triangular opening under the beak, form an area called the *deltidium*; the form and structure, the presence or absence of this, and the muscular impressions, afford good generic characters. The shell structure is so peculiar that a Brachiopod may be determined by the smallest fragment; it consists of flattened prisms arranged parallel to each other with great regularity. The animal has usually two long spiral prehensile arms developed from the sides of the mouth, and respires solely by the mantle. Brachiopods, of all the Molluscs, enjoy the greatest range in climate, depth and time. They mostly inhabit the deep sea; so that only 75 living species are known. They are among the oldest of existing forms of animal life. Over 1,200 extinct species have been described, distributed through all rocks of marine origin from the Cambrian upwards. They attained their maximum (both of generic and specific developments) in the Devonian age, and minimum in the upper Oolite. They are the most numerous fossils of the Silurian deposits. The hingeless genera (as *Lingula*) are most highly developed in the Palæozoic age. Of the

articulated genera, those having spiral arms appeared first; those with calcareous spires disappeared with the Lias period. Of the 77 Lower Silurian New York species, 51 are restricted to the Trenton Limestone. Brachiopods furnish the most numerous instances of recurrence, owing to their tenacity of life.

No. 690. **Spirifer pinguis**, Sow.

This Brachiopod, and the fifteen following, belong to the *Spiriferidæ*, a family characterized by the possession of internal calcareous spires (the mineralization of their coiled arms) extending from the centre of the shell outwards. From the Carboniferous limestone of Kildare, near Dublin, Ireland, and now in the Ward Museum of the University of Rochester.

Price, $0.30.

No. 691. **Spirifer arenosus**, Conrad.

From the Oriskany sandstone (Devonian), New York, and now in the private Geological Cabinet of Mr. Ward, Rochester. Cast of the interior.

Price, $0.30.

No. 692. **Spirifer cameratus**, Morton.

From the Coal Measures, Wintersett, Iowa. Price, $0.25.

No. 693. **Spirifer Grimesi**, Hall.

From the Burlington limestone (Sub-carboniferous), Burlington, Iowa.

Price, $0.50.

No. 694. **Spirifer Logani**, Hall.

From the Keokuk limestone (Sub-carboniferous), Nauvoo, Ill. Price, $0.50.

No. 695. **Spirifer macropleura**, Conrad.

From the Lower Helderberg (Upper Silurian), Albany Co, N, Y.

Price, $0.25.

No. 696. **Spirifer oxypteris**, Burvignier.

From the Lias of Carignan, France. Price, $0.25.

No. 697. **Spirifer pennatus**, Owen.

Shows well the area and deltidium. From the Hamilton group (Devonian), Independence, Iowa. Price, $0.30.

No. 698. **Spirifer striatus**, Martin.

This specimen of *S. striata* (the type of the genus) was found in the Carboniferous limestone at Enniskillen, Ireland. Price, $0.90.

No. 699. **Spirifer Verneuili**, Murch.

Long variety. From the Chemung group (Devonian), Southern New York.

Price, $0.50.

No. 700. **Spirifer Verneuili**, Murch.

Group on slab. From the same locality as the preceding, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 9 x 6. Price, $1.00.

No. 701. **Meristella elissa**, Hall.
From the Schoharie grit (Devonian), Schoharie, N. Y. Price, $0.20.

No. 702. **Meristella nasuta**, Conrad.
From the Upper Helderberg (Devonian), Williamsville, N. Y. Price, $0.15.

No. 703. **Meristella nasuta**, Conrad.
Interior cast. From Columbus, Ohio. Price, $0.15.

No. 704. **Athyris spiriferoides**, Eaton.
From the Hamilton group (Devonian), Western New York. Price, $0.20.

No. 705. **Retzia vera**, Hall.
(Var. *costata*.) From the Chester limestone (Sub-carboniferous), Chester, Ill. Price, $0.15.

No. 706. **Terebratula grandis**, Blum.

This and the twenty-four species following belong to the *Terebratulidæ*—a family of minutely punctate shells, usually round or oval, smooth or striated, the ventral valve having a prominent beak with a foramen, and two curved hinge-teeth, and the arm-supports having the form of a loop. From the Miocene Tertiary of Bunde, Westphalia. Price, $0.40.

No. 707. **Terebratula cor**, Lam.
From the Lias of Calvados, France. Price, $0.15.

No. 708. **Terebratula cornuta**, Sow.
From the Lias of Normandy, France. Price, $0.20.

No. 709. **Terebratula conglobata**, Deslongchamps.
From the Lias of Calvados, France. Price, $0.15.

No. 710. **Terebratula curvifrons**, Oppel.
From the Lias of Calvados, France. Price, $0.15.

No. 711. **Terebratula Darwini**, Deslong.
From the Lias of Normandy, France. Price, $0.15.

No. 712. **Terebratula Edwardsii**, Dav.
From the Lias of South Petherton, England. Price, $0.15.

No. 713. **Terebratula Eugenii**, Von Buch.
From the Lias, Germany. Price, $0.15.

No. 714. **Terebratula Guerangeri**, Deslong.
From the Lias of Calvados, France. Price, $0.15.

No. 715. **Terebratula indentata**, Sow.
From the Lias of Sarthe, France. Price, $0.15.

No. 716. **Terebratula intermedia,** Sow.
From the Lower Oolite of Calvados, France. Original in the Ward Museum of the University of Rochester. Price, $0.25.

No. 717. **Terebratula Lycetti,** Dav.
From the Lias of Ilminster, England. Price, $0.15.

No. 718. **Terebratula Mariæ,** D'Orb.
From the Lias of Calvados, France. Price, $0.15.

No. 719. **Terebratula Moorei,** Dav.
From the Lias of Petherton, England. Price, $0.15.

No. 720. **Terebratula numismalis,** Lam.
From the Lias of Calvados, France. Price, $0 20.

No. 721. **Terebratula perovalis,** Sow.
From the Lower Oolite of Calvados, France. Original in the Ward Museum of the University of Rochester. Price, $0.35.

No. 722. **Terebratula plicata,** Buckm.
From the Lower Oolite of Cheltenham, England. Price, $0.30.

No. 723. **Terebratula quadrifida,** Lam.
From the Lias of Calvados, France. Price, $0.20.

No. 724. **Terebratula resupinata,** Sow.
From the Lias of Saint Armand, France. Price, $0.15.

No. 725. **Terebratula Sarthacensis,** D'Orb.
From the Lias of Sarthe, France. Price, $0.15.

No. 726. **Terebratula subovoides,** Roemer.
From the Lias of Calvados, France. Price, $0.15.

No. 727. **Terebratula subnumismalis,** Dar.
From the Lias, England. Price, $0.15.

No. 728. **Stringocephalus Burtini,** Defrance.

Two specimens. In this genus the ventral valve is prolonged upwards into a very prominent, tapering beak, which is sometimes so curved forward as to rest upon the dorsal valve. This latter has a very long cardinal process which quite crosses the interior of the shell, and is forked at the extremity to meet the ventral septum. From the Devonian of Paffrath, Germany, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $1.25.

No. 729. **Rensselaeria ovoides,** Eaton.
From the Oriskany sandstone (Devonian), Albany Co., N. Y. Price, $0.30.

No. 730. **Calciola sandalina,** Defrance.

This anomalous form is of doubtful relations, and has been put by Davidson into a distinct family—the Calceolidæ. These specimens (four) are from the Middle Devonian, Gerolstein, Prussia, and are now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 6. Price, $0.60.

No. 731. **Rhynchonella increbescens,** Hall.

This and the succeeding ten Brachiopods belong to the *Rhynchonellidæ*, a family separated from the preceding to include all those "lamp shells" with sharp beaks, plaited valves, and short curved arm-supports. This specimen is from the Hudson River group (Lower Silurian), Iron Ridge, Wis. Price, $0.15.

No. 732. **Rhynchonella Barrandi,** Hall.
This specimen is from the Oriskany sandstone (Devonian), Albany Co., N. Y.
Price, $0.50.

No. 733. **Rhynchonella Deslongchampsi,** Dav.
From the Jurassic of France Price, $0.15.

No. 734. **Rhynchonella Eatonia-formis,** McChesney.
From the Coal Measures, Big Creek, Ill. Price, $0.15.

No. 735. **Rhynchonella meridionalis,** Coquand.
From the Jurassic of France. Price, $0.25.

No. 736. **Rhynchonella oblata,** Hall.
From the Hudson River group (Lower Silurian), Iron Ridge, Wisconsin.
Price, $0.25.

No. 737. **Rhynchonella speciosa,** Münst.
From the Middle Oolite, Kelheim, Bavaria. Price, $0.35.

No. 738. **Pentamerus oblongus,** Sow.

This fossil has a very wide distribution across the Silurian basin of the New York system, where it serves to mark and name a constant horizon—that of the "Lower Pentamerus limestone." Interior cast of an unusually large individual. From the Clinton group (Upper Silurian), near Milwaukee, Wis.
Price, $0.50.

No. 739. **Pentamerus oblongus,** Sow.
From the Clinton group (Upper Silurian), Rochester, N. Y. Price, $0.25.

No. 740. **Pentamerus galeatus,** Dalman.
From the Lower Helderberg (Upper Silurian), Albany Co., N. Y.
Price, $0.15.

No. 741. **Triplesia (Camerella) extans,** Conrad.
From the Trenton limestone (Lower Silurian), Middleville, N. Y.
Price, $0.15.

No. 742. **Orthis eminens,** Hall.
This form, and the nine following, belong to the *Orthidæ*, a family of transversely oblong, depressed shells, with straight hinge-line, notched area, small beak, rarely a medial fold, and no arm-supports. This specimen is from the Lower Helderberg (Upper Silurian), Albany Co., N. Y. Price, $0.20.

No. 743. **Orthis oblata**, Hall.

This specimen is from the Lower Helderberg (Upper Silurian), Albany Co., N. Y. Price, $0.20.

No. 744. **Orthis lynx**, Eichwald.
Two specimens, young and adult. From the Hudson River group, Ohio. Price, $0.40.

No. 745. **Orthis musculosa**, Hall.
Interior cast. From the Oriskany sandstone, Albany Co., N. Y. Price, $0.25.

No. 746. **Orthis occidentalis**, Hall.
From the Hudson River group (Lower Silurian), Savannah, Ill. Shows finely the areas and deltidium. Price, $0.25.

No. 747. **Orthis subcarinata**, Hall.
From the Lower Helderberg (Upper Silurian), Albany Co., N.Y. Price, $0.15.

No. 748. **Streptorhynchus hipparionyx**, Vanux.
Interior of Valve. From the Oriskany sandstone (Devonian), Albany Co., N. Y. Price, $0.40.

No. 749. **Streptorhynchus (Orthis) umbraculum**, Buch.
Two specimens, on pedestal. From the Sub-carboniferous, Gerolstein, Rhenish Prussia, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 750. **Strophodonta magnifica**, Hall.
From the Oriskany sandstone (Devonian), Albany Co., N.Y. Price, $0.35.

No. 751. **Strophodonta vascularis**, Hall.
From the same locality as the preceding. Price, $0.35.

No. 752. **Productus pyxidiformis**, Koninck.

The *Productidae*, to which this and the next three Brachiopods belong, are concavo-convex shells, with straight hinge-line, large beak, and no arm-supports. From the Carboniferous limestone, Derbyshire, England, and now in the Ward Museum, University of Rochester. Price, $0.60.

No. 753. **Productus costatus**, Sow.
From the Coal Measures, Iowa. Price, $0.20.

No. 754. **Productus Wilberianus**, McChesney.
This specimen is from the Carboniferous limestone, Missouri. Price, $0.35.

No. 755. **Productus giganteus,** Martin.

An unusually large specimen from the Carboniferous limestone of Derbyshire, England, and now in the Ward Museum of the University of Rochester.

Size, 6 x 4. Price, $0.90.

No. 756. **Discina ampla.**

This representative of the *Discinidæ* is from the Oriskany sandstone, Albany Co., N. Y, Price, $0.25.

No. 757. **Trematospira multistriata,** Hall.

This Brachiopod has the internal spires of *Spirifer* and the beak of *Atrypa*. From the Lower Helderberg (Upper Silurian), Albany Co., N. Y. Price, $0.15.

This entire Suite of Brachiopoda,—Nos. 690–757,—includes 65 species and 17 genera, represented by 74 specimens. Price, packed, $20.00.

CLASS VI.—TUNICATA.

These "cloaked" Molluscs, represented by the Ascidians, are invested in a leathery tunic, answering to the shells of the Bivalves. This covering is unlike anything else in the Animal Kingdom in that it is composed chiefly of vegitative cellulose. The blood is carried backwards and forwards along the same vessels, as was supposed to be the case in the human system before the time of Harvey. "The Tunicates (says Milne Edwards) depart from the Molluscan type in mode of circulation, in the metamorphosis which the fry undergo, and above all in the singular power which most of them possess of multiplying by gemmation." The Tunicates exist in all seas from low-water to a considerable depth. Owing to the absence of calcified parts, they have not been found fossil.

CLASS VII.—BRYOZOA.

These "moss animals," the Polyzoa of Thompson (including, according to Agassiz, the *Vorticellæ*), constitute the lowest class of the sub-kingdom. In the words of the Cambridge Professor, they are "depauperated Molluscs." Long confounded with Zoöphytes, they were

elevated to their present position by Milne Edwards. They look like Corals, having minute cells either in branched, reticulated or incrusting forms. They never occur singly. No organ of special sensation has been discovered, and but one ganglionic centre. D'Orbigny enumerates 1,676 fossil species. One of the oldest known fossils, *Oldhamia*, is supposed to be a Bryozoan, so likewise some of the Graptolites. The most common Palæozic form is *Fenestrella*.

No. 758. **Archimides Wortheni,** Hall.

Four specimens on slab. These remarkable Bryzoans, having spiral axes, are from the Keokuk limestone (Sub-carboniferous), Warsaw, Ill. Size, 12 x 4. Price, $1.25.

FOURTH SUB-KINGDOM.

RADIATA.

This division includes all those animals whose plan of structure is that of radiation from a centre. The essential form of all Radiates is an "organic sphere," of which the main axis is vertical, and around which the primary elements radiate uniformly,—the structure presenting none of that bilateral symmetry which obtains in the three higher sub-kingdoms. There are three natural Classes, exhibiting the three different ways in which the radiation is carried out; and they all show the radiation in the distribution of both external and internal organs. Five is the typical number,—nearly all the varied forms repeating it in their arms, jaws, ambulacræ, eyes, etc. Even the cartilaginous framework of the disc of every sucker is regulated by this mystic number! "The form has its nearest approach to the sphere in the Echinus; it becomes cylindrical in the Hollothuria; stellate in the Star-fish; bell-shaped in the Acaleph; and trumpet-shaped in the Polyp. No branch of the Animal Kingdom presents so great a diversity of attitudes as the Radiates." Nor do we elsewhere find an entire group of animals so captivating by the exquisite geometry of their forms, or of such delicate, fascinating colors. The living Radiates number about 10,000 species, and are found in all seas, although they increase rapidly in numbers toward the tropics, and offer more forms in the southern than in the northern hemisphere. A single genus, *Hydra*, inhabit fresh-water. This sub-kingdom has been represented with great richness of forms throughout all periods of geological time, and with a steady increase in numbers from the Palæozoic to the present.

CLASS I.—ECHINODERMATA.

This Class is the true type of the Sub-kingdom. In it we first recognize strikingly the radiate characters. The name was given by Bruguiéres, because many of the species are spine-clad. They are, however associated together by another and more general tegumentary character; the skin is almost always perforated by minute foramina, through which tubular feet can be protruded and retracted, constituting the common organs of adhesion and locomotion. No Class of the Animal Kingdom more clearly exhibits a gradation of structure. For while some are rooted to the sea-bottom and thus resemble the Polyps, others have true rayed forms clothed in prickly armor; and these conduct us to soft, elongated organisms that mimic the Molluscs, or seem to stand on the lowest step of the Articulate division. The Echinoderms are all marine. While the soft-bodied Radiates float in the open sea; to the shores and fathomable depths are limited the better defended Class as being better able to bear the brunt of the ceaseless conflict between land and water. Unlike the Acaleph and Polyp, the Echinoderm has its organs distinct from the walls of the body. The stomach is a loose bag suspended in the general cavity, with intestine appendages. The nervous system consists of a chord, usually pentagonal, surrounding the pharynx, with branching filaments. The mouth is usually central and surrounded by a circle of tentacles. In the Crinoids, the arms are near the mouth upon the ventral surface; in the Star-fishes and regular Sea-urchins, it is exactly opposite the mouth; in the Holothurioids, it is at the posterior end of the body.

The Class has been represented in all geological periods, but reached its maximum development in the Mesozoic Age. "More difficult of study than shells (says Professor Owen), and less uniformly present in all strata, the enduring remains of Echinoderms and Corals are unsurpassed in beauty of form and structure, and in the value of the evidence they afford."

Order 1.—Holothurioidea.

These vermiform Echinoderms, vulgarly called "Sea-cucumbers," constitute the highest Order of the Class. They may be compared to Sea-urchins deprived of their spines, with the shell softened, and elongated by separation of the anus and mouth. The body is either cylindrical or pentagonal, with scattered patches of calcareous deposit.

The living Holothurioids are often found beneath stones at very low water. The only examples of fossilization are small fragments from the Upper Oolite of Bavaria, the Chalk of Warminster, and the northern Drift of Bute, Scotland.

Order 2.—Echinoidea.

The body of the Echinus is enclosed in a firm hollow shell, formed of polygonal plates united by sutures in twenty vertical series, arranged in ten pairs. This shell (or *skeleton* more properly, for it is not strictly external) has a spherical, oval, pentagonal, hemispherical, conoidal, or discoidal form. There are six areas: ambulacral, interambulacral, ocular, genital, oral and anal. Ten broad bands (interambulacral) alternate with ten narrow bands (ambulacral). The former are studded with tubercles bearing spines which articulate by a ball and socket joint. The latter have a few smaller tubercles and spines, or none at all, and appear like "walks" through the spinous tracks—whence the name given by Linnæus. They are traversed by numerous pores for the exsertion of tubular feet or suckers, which are used for locomotion. At the summit of the test is a disk composed of five genital plates, and five ocular plates notched for lodging the eyes. The mouth has five sharp angular teeth, tipped with enamel. These representatives of molars and incisors move upon each other; and the entire pyramidal mass can be protruded and retracted. This description of the Echini will not accurately apply to the irregular forms. In these the ambulacra are often only half of the typical number, and often only partial in their extent. In many, too, the oral and anal openings lose their central position, and approach the margin. The mouth, also, is sometimes toothless. The mouth is central and dental in the *Cidaridæ*, *Echinidæ*, *Salenidæ*, *Galeritidæ* and *Clypeasteridæ*; it is more or less eccentral and edentulous in the *Echinonidæ*, *Collyritidæ*, *Echinolampidæ* and *Spatangidæ*.

The fossils of this Order are usually divided into three groups: *Cidaridæ* or Turban-shaped Echini, *Clypeasteridæ* or Buckler-shaped Echini, and *Spatangidæ* or Heart-shaped Echini. These include 71 genera and about 700 species. They are rare in the Palæozoic—the oldest occurring in the Upper Silurian—and attained their maximum in the Oolite and Cretaceous strata. The regular forms appeared first; the elongated forms are more recent. The geological history of Echini places them between the Crinoids and Star-fishes. The Crinoids abounded in the Palæozoic seas, but are now reduced to one or two species; the Star-fishes began feebly in the Trias, but now the seas of all latitudes swarm with them; while the Echini increase to the Cretaceous, and decline from it

REGULAR.

Cidaridæ.

No. 759. **Acrocidaris nobilis,** Agass.

This very beautiful Echinus is subconical, and the ambulacral tubercles are much smaller than the interambulacral. It is from the Coral Rag (Middle Oolite), France. Price, $0.30.

No. 760. **Archæocidaris Agassizi,** Hall.

This ancient representative of the *Cidaridæ* has on each of the interambulacral plates a large tubercle, perforated and surrounded with a high ring. The specimen is from the Burlington limestone (Sub-carboniferous), Burlington, Iowa Price, $0.30.

No. 761. **Archæocidaris Wortheni,** Hall.

Group. From the St. Louis limestone (Sub-carboniferous), St. Louis, Mo. Size, 8 x 3. Price, $0.60.

No. 762. **Cidaris coronata,** Goldf.

Two specimens. In the *Cidaris* proper the form is symmetrical, the tubercles are perforated, the ambulacra narrow, and the two lines of pores close together. This species is depressed, and its tubercles are few in number and of large size. These specimens are from the Coral Rag (Middle Oolite), Nattheim, Wirtemberg, and belong to the Ward Museum, University of Rochester. Price, $0.60.

No. 763. **Cidaris clavigera,** Koenig.

Group of spines. The tubercles of this species are large and imperforate; the spines are large, clavate, and crowded with longitudinal, prickly ribs; the test is of medium size. This specimen is from the Upper Chalk, England, and now in the Ward Museum, University of Rochester. Price, $0.75.

No. 764. **Cidaris Drogiaca,** Cotteau.

This is one of the largest of all the known species. From the Jurassic limestone of Druyes, France. Price, $0.60.

No. 765. **Cidaris pleracantha,** Agass.

Spine. The spines of this remarkable species, by which it is chiefly known, are subcylindrical when small, ovoid when of medium size, and pyriform when large. They are always covered with very fine longitudinal striæ. This specimen is from the White Chalk of Meudon, France. Price, $0.20.

No. 766. **Cidaris subvesiculosa,** D'Orb.

Group of spines. The tubercles of this species are proportionally small, and encircled with very distinct rings. The spines are long and slender. From the Upper Chalk of Kent, England, and now in the Ward Museum, University of Rochester. Price, $0.50.

No. 767. **Cidaris venulosa,** Agass.

From the Maestricht beds (Cretaceous), Northern Europe. Price, $0.50.

No. 768. **Cidaris glandifera,** Goldf.

Two spines. The spines of this species are called "Jew-stones" by the Pilgrims, who bring them in large numbers from the Holy Land. They are pyriform, and covered with granules. From the Jurassic (?), Mount Carmel, Palestine, and now in the Ward Museum of the University of Rochester. Price, $0.30.

No. 769. **Cidaris Blumenbachii,** Münst.

Spine. This beautiful, characteristic, turban-shaped Echinus has an inflated test, large, prominent tubercles, and elongated spines covered with longitudinal granulated striae. This spine is from the Coral Rag (Middle Oolite), Wilts, England. Price, $0.15.

No. 770. **Cidaris filamentosa,** Agass.

Group of spines, on slab. The spines of this species resemble those of *C. sceptrifera,* but are larger; the granules are sharp, and arranged in very regular series. From the Upper Cretaceous of France. Now in the Ward Museum of the University of Rochester. Price, $0.50.

No. 771. **Cidaris Suevica,** Desor.

A distinctive feature in this Urchin is a double row of granules of unequal size along the ambulacra. From the Upper Oxfordian (Middle Oolite), Wirtemberg. Price, $0.50.

No. 772. **Codechinus Tallavignesi,** Cotteau.

The test of this Cidarite is conical, higher than wide; ambulacra narrow; tubercles narrow and imperforated. From the Cretaceous, Department of Aude, France. Price, $0.40.

No. 773. **Glypticus hieroglyphicus,** Agass.

This Cidarite has broad ambulacra: while the tubercles of the ambulacra are imperforate, and those of the interambulacra are replaced by irregular asperites. The spines are unknown. The species characterizes the Coral Rag (Middle Oolite) of France and Switzerland. Price, $0.20.

No. 774. **Glypticus Burgundiacus,** Mich.

This large and beautiful species is very rare. From the Oxfordian (Middle Oolite), Estrochey, France. Price, $0.15.

No. 775. **Goniopygus Menardi,** Agass.

This Urchin, belonging to the *Cidaridæ* with broad ambulacra, has a solid apical disc, small, imperforated tubercles, and large mouth. From the Upper Greensand (Cretaceous), Lemans, France. Price, $0.20.

No. 776. **Hemicidaris intermedia,** Fleming.

This large, depressed genus belongs to the *Cidaridæ* with narrow ambulacra. The distinctive feature is the existence of small tubercles on the lower half of the ambulacra. The spines are cylindrical and finely striated. From the Oolite of Calne (Wiltshire), England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $ 0.30.

No. 777. **Hemicidaris crenularis,** Agass.

With spines, on slab. This species is probably identical with the preceding one. From the Coral Rag (Middle Oolite), Rochelle, France.

Size, 6 x 4. Price, $0.75.

No. 778. **Hemicidaris Boloniensis,** Cott.

From the Kimmeridge Clay (Upper Oolite), Boulogne-sur-mer, France. Now in the Ward Museum of the University of Rochester. Price, $0.30.

No. 779. **Hemicidaris diadematа,** Agass.

From the Coral Rag (Middle Oolite), Nattheim, Wirtemberg. Price, $0.40.

No. 780. **Hemicidaris mammosa,** Agass.

This form is remarkable for its narrow, wavy ambulacra, and large tubercles. From the Coral Rag (Middle Oolite), Rochelle, France. Price, $0.25.

No. 781. **Palæchinus (Melonites) multipora,** Norwood and Owen.

Group, on slab. This gigantic Echinoderm—some specimens measuring five and a half inches in vertical diameter and four transversely,—has an ovoid form, central mouth and anus, ten areas, interambulacral plates mostly hexagonal, and the ambulacral plates hexagonal and rhomboidal. The ranges of plates number 65; and each plate is perforated by two holes. From the St. Louis limestone (Sub-carboniferous), St. Louis, Mo. Size, 12 x 12. Price, $1.50.

No. 782. **Palæchinus (Melonites) multipora,** Norwood and Owen.

Group, on slab. From the same locality as the preceding.

Size, 12 x 7. Price, $1.25.

No. 783. **Psammechinus monilis,** Münst.

This small Cidarite with wide ambulacra is from the Miocene Tertiary of France. Price, $0.15.

No. 784. **Pseudodiadema hemisphæricum,** Agass.

A Cidarite with broad ambulacra. From the Coral Rag (Middle Oolite), Calvados, France. Now in the private Geological Cabinet of Mr. Ward, Rochester.

Price, $0.30.

No. 785. **Pseudodiadema Orbignyanum,** Cott.

With spines, on slab. From the Coral Rag (Middle Oolite), Department of Yonne, France. Price, $0.60.

No. 786. **Pseudodiadema Orbignyanum,** Catt.

From the same formation and locality as the preceding. Price, $0.30.

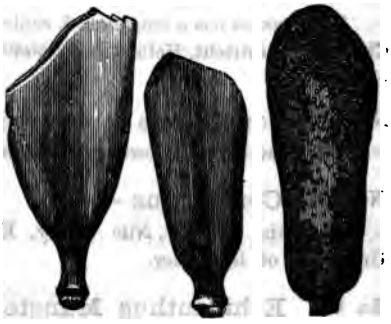
No. 787. **Phymosoma (Cyphosoma) Kœnigii,** Mant.

This Cidarite, with wide ambulacra, large, imperforated tubercles, and depressed shell, is from the Upper Chalk, Sussex, England. Price, $0.40.

No. 788. **Phymosoma Beaumonti,** Agass.

From the Chalk of Plaisance, France. Price, $0.30.

No. 789. **Rhabdocidaris copeoides,** Desor.



(Syn. *Cidaris copeoides*, Agass.) Four specimens of spines. This Urchin belongs to the *Cidaridæ* having narrow ambulacra. The spines vary very much in size and form on different parts of the test, and at different stages of development. From the Oxfordian (Middle Oolite), Latrecy, France. Price, $0.75.

No. 790. **Rhabdocidaris nobilis,** Desor.

From the Coral Rag (Middle Oolite), Nattheim, Wirtemberg. Price, $0.50.

No. 791. **Stirechinus Scillæ,** Desm.

(Syn. *Echinus costatus*, Agass.) From the Pliocene Tertiary of Sicily. Price, $0.30.

No. 792. **Stomechinus Robinaldinus,** Cott.

This beautiful Cidarite with wide ambulacra and imperforate tubercles, is very rare. From the Coral Rag (Middle Oolite), Tonnerre, Yonne, France. Price, $0.50.

IRREGULAR.

Cassidulidæ.

No. 793. **Amblypygus Americanus,** Mich.

From the Nummulitic (Middle Eocene) of the Island of Jamaica. Price, $0.30.

No. 794. **Botriopygus obovatus,** D'Orb.

This Urchin, from the Upper Neocomian (Cretaceous) of Switzerland, is often confounded with *Pygaulus Morloti*, Desor.; but it differs in not being regularly ovoid—being enlarged posteriorly, and by its sub-anal furrow. Price, $0.30.

No. 795. **Clypeus Davoustianus,** Cott.

This discoidal, inflated Urchin, with central ambulacral apex, is from the Great Oolite, Becheseul, France. Price, $0.35.

No. 796. **Clypeus (Nucleolites) Plotii,** Klein.

This is well characterized by its depressed shell with circular contour; large, lanceolate ambulacral areas; and deep oval furrows, prolonged to the summit, which is eccentric. From the Lower Oolite, Cheltenham, England. Price, $0.50.

No. 797. **Conoclypus conoideus,** Agass.

This species has an oval, very high, subconical test, with very large poriferous zones. The form is rare in the tribe (*Nucleolites*) to which it belongs. From the Eocene Tertiary. Price, $0.90.

No. 798. **Conoclypus Leskei,** Agass.

This species has a lengthened, conical form with eccentric apex. From the Chalk of Maestricht, Holland, and now in the Ward Museum, University of Rochester. Price, $0.60.

No. 799. **Conoclypus semiglobus,** Lam.

From the Miocene Tertiary, Clermont, France. Price, $0.90.

No. 800. **Conoclypus ——,**

From the Tertiary, Nile Valley, Egypt, and now in the Ward Museum, University of Rochester. Price, $0,90.

No. 801. **Echinanthus Munsteri,** Desm.

In this genus the test is very concave underneath, the summit eccentric, and the oral aperture marginal. This rare specimen is from a ferruginous oolitic clay-stone (Eocene Tertiary ?), Bayreuth, Bavaria. Price, $0.40.

No. 802. **Echinobrissus (Nucleolites) clunicularis,** Blainv.

Two specimens. This genus is a section made at the expense of *Nucleolites*, to include those shortened and square forms with united poriferous zones. From the Lower Oolite of Stroud, England, and now in the Ward Museum of the University of Rochester. Price, $0.30.

No. 803. **Echinolampas Beaumonti,** Agass.

This Echinus has an ovoid test, with large petaloid ambulacra, and eccentric summit. From the Nummulitic limestone (Eocene Tertiary), Verona, Italy. Price, $0.30.

No. 804. **Echinolampas hemisphericus,** Agass.

From the Miocene Tertiary, France. Price, $0.30.

No. 805. **Echinolampas Kleinii,** Desm.

This discoidal species is from the Pliocene Tertiary, Bunde, Prussia, and is now in the Ward Museum, University of Rochester. Price, $0.40.

No. 806. **Echinolampas ——.**

A large flattened species. From the European Tertiary. Price, $0.60.

No. 807. **Faujasia apicalis,** D'Orb.

(Syn. *Pygurus apicalis,* Desor.) This species is conical, with the ambulacral summit a little eccentric, and the mouth subcentral. From the Upper Chalk of Maestricht, Holland. Price, $0.20.

No. 808. **Pygorhynchus Grignonensis,** Agass.

In this species, the posterior side is truncated, the under side concave, and the mouth a little more eccentric than the summit. Itis the *Nucleolites Grignonensis* of Defrance. It characterizes the Cal. caire Grossier (Middle Eocene Tertiary) in the environs of Paris. Price, $0.20.

No. 809. **Pygurus Blumenbachii,** Agass.

This genus, of the group *Nucleolites,* is akin to *Echinolampas.* It has a very prominent anal beak, eccentric mouth and summit, and lanceolate petals. From the Coral Rag (Middle Oolite), Tonnerre, France. Original in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.35.

No. 810. **Pygurus Davoustianus,** Cott.

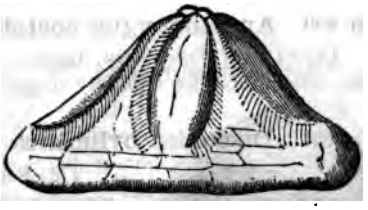
From the Great Oolite, Sarthe, France. Price, $0.40.

No. 811. **Pygurus lampas,** Bèche.

(Syn. *Pygurus trilobus,* Agass.) From the Upper Greensand (Cretaceous), Lemans, France. Price, $0.35.

Clypeastridæ.

No. 812. **Clypeaster altus,** Lam.



Two specimens. This genus, one of the true *Clypeastridae,* includes the largest of sea-urchins. The shell is oblong; mouth angular and furnished with well developed teeth; tubercles, mere granules, and the spines proportionally small. The shell of this species is subpentagonal, and the ambulacral portion is much elevated. These specimens—from the Eocene Tertiary of the Isle of Malta—are now in the Ward Museum of the University of Rochester.

Size of each, 6 x 5. Price, $1.50.

No. 813. **Clypeaster grandiflorus,** Bronn.

A smaller and flatter form from the Miocene Tertiary, Montpelier, France, and in the same Museum as the preceding. Price, $0.50.

No. 814 **Clypeaster umbrella,** Agass.

This inflated form, with interambulacra rising into ribs, is from the Miocene Tertiary, Sardinia, and belongs to the Ward Museum, University of Rochester. Price, $0.75.

No. 815. **Laganum ellipticum,** Agass.

This Clypeastroid with lanceolate petals is small, elliptical, and depressed. From the raised Beaches (Recent), east shore of the Red Sea, Arabia, and now in the Ward Museum, University of Rochester. Price, $0.25.

No. 816. **Scutella disca,** Mather.

This American Clypeastroid is from the Tertiary of Georgia. Price, $0.30.

No. 817. **Sismondia costulata,** Desor.

(Syn. *Echinocyamus costulatus,* Desor.) A Clypeastroid, convex above, concave underneath; petals broad and elliptical; central summit; marginal anus. From the Tertiary (?) of Europe. Price, $0 90.

Dysasteridæ.

No. 818. **Collyrites carinata,** Desm.

This small species is essentially cordiform, with a keel more or less marked. From the Oxfordian (Middle Oolite), Wurtemberg. Price, $0.15.

No. 819. **Collyrites elliptica,** Desm.

(Syn. *Dysaster ellipticus* Agass.) A large inflated species. From the Callovien (Middle Oolite), France. Price, $0.50.

Galleridæ.

No. 820. **Anorthopygus costellatus,** Desor.

(Syn. *Pygaster costellatus,* Agass.) This species has a circular, depressed form, with small tubercles regularly disposed. It is from the Cretaceous of France. Price, $0.25.

No. 821. **Discoidea cylindrica,** Agass.

This Echinus has a hemispherical test, the height sometimes exceeding its diameter, and very small tubercles arranged in concentric series. From the Chalk-marl (Cretaceous) of Rouen, France, and now in the Ward Museum of the University of Rochester. Price, $0,25.

No. 822. **Discoidea cylindrica,** Agass.

(Var. *alta.*) From the Chalk-marl (Cretaceous), France. Price, $0.35.

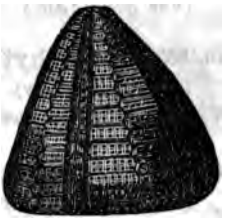
No. 823. **Echinoneus cyclostomus,** Leske.

This small species has an elongated, inflated test, with numerous tubercles, mamillated but not perforated. From the Calcareous tufa (Recent), Guadaloupe, W. I. Price, $0.20.

No. 824. **Galerites subsphæroidalis,** D'Archiac.

From the Lower Chalk, Fauge, France. Price, $0.20,

No. 825. **Galerites albogalerus,** Lam.



Pyramidal variety. This lofty, almost turreted, form, with marginal anus, is from the Upper Chalk, Kent, England, and now in the Ward Museum, University of Rochester. Price, $0.30.

No. 826. **Galerites albogalerus,** Lam.

Pyramidal variety; inner mould. From the same locality and Museum as the preceding. Price, $0.20.

No. 827. **Galerites albogalerus,** Lam.

Spherical variety. From the same locality and Museum as the preceding. Price, $0.25.

No. 828. **Hyboclypus sandalinus,** Merian.

From the Callovian (Middle Oolite), France. Price, $0.25.

No. 829. **Pygaster semisulcatus,** Wright.

This Echinus is depressed, with a subpentagonal contour; the anus is very large, and situated on the superior face. From the Lower Oolite, Cheltenham, England. Price, $0.35.

Spatangidæ.

No. 830. **Ananchytes ovata,** Lam.

A Spatangoid, distinguished by having a high, conical form, and much compressed laterally. This genus, says Desor, is the most characteristic of all fossil Echini, and the one most useful to Geologists, not only from its frequent occurrence, but also from its well defined characters. It is from the Chalk of Meudon, France, and belongs to the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 831. **Ananchytes ovata,** Lam.

(Var. *carinata,* Defr.) From the same locality and Museum as the preceding. Price, $0.40.

No. 832. **Ananchytes ovata,** Lam.

(Var. *carinata,* Defr.) Inner mold. From the same locality as the preceding, and now in the Ward Museum, University of Rochester. Price, $0.30.

No. 833. **Ananchytes ovata,** Lam.

(Var. *gibba,* Lam.) From the Chalk of Kent, England, and now in the private Cabinet of Mr. Ward, Rochester. Price, $0.50.

No. 834. **Ananchytes ovata,** Lam.

(Var. *gibba*, Lam.) Interior cast, showing ambulacral lines. Price, $0.60.

No. 835. **Ananchytes ovata,** Lam.

(Elliptical variety). From the Chalk of Meudon, France, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 836. **Ananchytes ovata,** Lam.

(High variety). From the Chalk of Kent, England, and now in the Ward Museum, University of Rochester. Price, $0.50.

No. 837. **Brissus cylindricus,** Agass.

(Syn. *B. oblongus*, Forbes). The Echini of this genus, vulgarly known under the name of "Sea-eggs," were described by Aristotle. They have an oval form, with the summit eccentric anteriorly. This species is peculiar to the Pleistocene (Quaternary) at Palermo, Sicily. Price, $0.30.

No. 838. **Cardiaster bicarinatus** D'Orb.

(Syn. *Holaster bicarinatus*, Agass.) This large Spatangoid is from the Chalk of Ciply, France. Price, $0.50.

No. 839. **Hemiaster bufo,** Desor.

(Syn. *Spatangus bufo*, Brongn.) A heart-shaped Echinus from the Lower Chalk, Rouen, France. Price, $0.25.

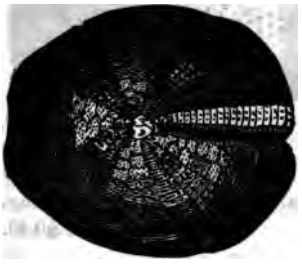
No. 840. **Hemiaster cubicus,** Desor.

A very swollen form, and square at the extremities. From the Chalk near Suez, Egypt. Price, $0.30.

No. 841. **Hemipatagus Hoffmanni,** Goldf.

This is one of the largest species of this Spatangoid genus. From the Pliocene Tertiary, Bunde, Westphalia. Price, $0.80.

No. 842. **Hemipneustes radiatus,** Agass.



This Spatangoid is an inflated Urchin, as high as broad, and nearly perpendicular in front, where there is a deep, narrow furrow. The ambulacral summit is central; the ambulacra are very large and winding; the tubercles small; and the anus is on the posterior border. From the Upper Chalk of Maestricht, Holland, and now in the Ward Museum, University of Rochester. Price, $0.75.

No. 843. **Holaster latissimus,** Agass.

This Echinus is remarkable for its size. It is cordiform, with large ambulacra, a deep anterior furrow, central ambulacral summit, transversely oval mouth. From the Gault (Cretaceous), France, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 844. **Holaster subglobosus,** Agass.

This species is very nearly as convex on the under side as above. This specimen is above the ordinary size and has the apex unusually elevated. From the Upper Greensand (Cretaceous), Rouen, France, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 845. **Linthia crucia,** Desor.

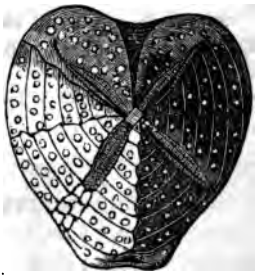
(Syn. *Brissus cruciatus,* Agass.) This large cordiform Echinus, allied to *Periaster,* has long, deep petals, the ambulacral summit slightly eccentric, and a wide anterior furrow From the Miocene Tertiary, Capri, Italy.

Size, 7 x 6. Price, $1.25.

No, 846. **Macropneustes bissoides,** Leske.

This Spatangoid is nearly cylindrical, truncated behind, with large tubercles irregularly distributed, and long petals. From the Nummulitic limestone (Middle Eocene Tertiary), Montfort, France, Price, $0.50.

No. 847. **Micraster cor-anguinum,** Agass.



This genus of *Spatangidæ* is so termed from the star-like arrangement of its four small ambulacra. The test is heart-shaped, and wider before than behind, with a furrow in front; the tubercles are small, and irregularly distributed; the mouth is transverse, situated anteriorly, and protected by a projection of the odd inter-ambulacrum. From the Chalk,Kent, England, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 848. **Micraster (Epiaster) acutus,** Agass.

This Echinus is of triangular form, and has very concave petals. From the Upper Greensand (Cretaceous), France. Price, $0.30.

No. 849. **Pericosmus Edwardsii,** Agass.

A Spatangoid from the Miocene Tertiary of Superga, Italy. Price, $0.30.

No. 850. **Schizaster ambulacrum,** Agass.

This Spatangoid is well characterized by very deep and unequal petals, and eccentric summit. From the Nummulitic limestone (Middle Eocene Tertiary), Biarritz, France. Price, $0.35.

No. 851. **Schizaster (Spatangus) Scillæ,** Desm.

From the Miocene Tertiary of Corsica. Price, $0.40.

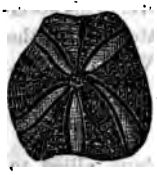
No. 852. **Schizaster vicinalis,** Agass.

From the same locality as the preceding. Price, $0.30.

No. 853. **Spatangus Pareti,** Agass.

This cordiform, inflated Echinus is rare. From the Miocene (?) Tertiary of Italy. Price, $0.75.

No. 854. **Toxaster complanatus,** Agass.



From the Upper Neocomian (Lower Greensand, Cretaceous), Auxerre, France, and now in the Ward Museum, University of Rochester. Price, $0.20.

No. 855. **Toxaster amplus,** Desor.

(Syn. *T. complanatus,* var. *ampla,* Agass.) From the same locality and Museum as the preceding. Price, $0.30.

This entire Suite of Echinoidea,—Nos. 759–855,—includes 86 species and 48 genera, represented by 105 specimens. Price, packed, $40.00.

Order 3.—Asteroidea.

The Star-fishes well represent the sub-kingdom. The common form is that of a star with five rays, which are prolongations of the body,—the viscera extending into them. The dorsal and lateral surfaces of the animal are covered by a coriaceous skin, strengthened by a net work of calcareous plates. These ossicles have a persistent arrangement in the various genera, so that they afford good evidence of the rank of the owner among the Radiates, as the bones of the Reptile or Mammal do among Vertebrates. There is one ossicle situated on the side of the centre of the disc which differs from all the other bones in being marked with radiating grooves, and is called the madreporiform plate. It appears to be the analogue of the stem of the Crinoid. In the centre of the ventral surface is the toothless mouth surrounded by a bony ring.

The eyes are generally situated at the end of the rays. In the *Ophiuridæ,* the long, slender, serpent-like arms are special organs of locomotion, being independent of the visceral cavity; and according to some naturalists, the family holds the same relation to the Crinoids that the other Star-fishes hold to the Sea-urchins.

Fossil Star-fishes, though less common, have a wider range than fossil Echini. They are found in every geological period, attaining their

maximum in the present seas. The Palæozoic species differ from recent ones in having the plates perforated by pores. No family of Star-fishes has become extinct.

No. 856. **Asterias** ——.
From the Hamilton group (Devonian) Otsego Co., N. Y. Price, $0.50.

No. 857. **Asterias** (?) ——.
Two specimens, showing both sides; very perfect. From the Hamilton group (Devonian). Price, $1.00.

No. 858. **Asterias** ——.
Impression on a black Permian slate (Kupferschiefer), from Riegensdorf, Germany, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 859. **Astropecten** ——.
This finely preserved Star-fish (the *Crenaster* of Luid) was found in the Calc-grit (Lias), near Whitby, England, and now belongs to the private Geological Cabinet of Mr. Ward, Rochester. Size, 9 x 8. Price, $1.50.

No. 860. **Ophioderma Egertoni,** Broderip.

This genus differs from the *Ophiura* proper in having four (instead of two) genital fissures in each interval between the arms. This specimen is from the Lias of Lyme-Regis, England, and now in the Ward Museum of the University of Rochester. Price, $0.60.

No. 861. **Ophioderma Egertoni,** Brod.
A slab, showing 17 individuals in an unusually perfect condition. This unique specimen, from the same locality as the preceding, is now in the private Geological Cabinet of Mr. Ward, Rochester. Size, Price, $2.50.

No. 862. **Palæaster** ——.
This generic term has been applied by Professor Hall to the Silurian species of *Asteridæ*. According to Agassiz, all the Palæozoic forms differ from the recent Star-fishes in having the plates perforated by pores. This specimen is from the Hudson River group (Lower Silurian), Cincinnati, Ohio. Price, $0.30.

No. 863. **Solaster Moretonis,** Forbes.
This beautiful and well-preserved fossil seems as if it were the head of a Crinoid with out-spread arms, crushed flat. A nearer inspection shows that it is really a Star-fish, resembling the living *Uraster helianthus* from the Pacific coast of South America. From the Great Oolite, Windrush Quarry, Gloucestershire, England. Size, 6 x 6. Price, $1.00.

Order 4.—Crinoidea.

The Crinoids are among the most remarkable fossils that lie entombed in the earth; and it is only within the last century and a half that their place in nature began to be understood. For ages the superstitious or imaginative peasantry called them "St. Cuthbert's beads," "rosary beads," "giants' tears," "fairy stones," "wheel-stones," "screw-stones," and "pulley-stones." By early naturalists they were termed "Trochites," "Entrochus," and "Encrinus." Their animal origin was established by Rosinus in 1719; and their classification first correctly made by Miller in 1821.

In a typical specimen, there are three parts: the root—a calcareous secretion which fixes the animal to some sub-marine rock; a hollow jointed stem; and a corolla-shaped body provided with five solid arms, independent of the visceral cavity and adapted to prehension. The mouth is central and placed upwards; the vent is situated on its side. The normal position of the Crinoid is the reverse of the Star-fish and Echinus. There were three modes of existence: some were fixed in the midst of coral-banks at great depths, as *Encrinus liliiformis*; others were free, yet clinging to different bodies at the bottom of the ocean, as the young *Comatula*; and others still were disposed in such a way that their bulbiform body was buried in the mud, as *Marsupites*. The geographical extent of the Crinoids is very limited; and in their geological range also they appear to be more restricted than other forms. Of the 105 genera described, 37 are confined to a single formation (Silurian); and of 286 species, scarcely one extends beyond the rock or group of which it is typical. None pass from the Palæozoic to the Secondary. They are among the earliest relics of animal organization; and after the microscopic organisms and Polyps, they have taken the largest share in modifying the composition of the earth's crust. Like the Corals, their chief function seems to have been the secretion of lime from the ocean,—whole strata of limestone being almost entirely made of their remains. They appear first in the Lower Silurian (Potsdam), and culminate in the Lower Carboniferous. There were over 500 Palæozoic species; 75 Jurassic; 15 Cretaceous. The column is reared in nearly all the Palœozoic forms; but pentagonal discs commence in the Lower Silurian. Fixed Crinoids began with the Silurian period and decreased; free Crinoids began in the Oolite and thence rapidly diminished. The appearance of arms has been regarded as a stage of progress in development: from that moment, the variety of forms augments with astonishing rapidity. The solid calyx of *Cystidea* diminishes steadily, and in *Pentacrinus* barely forms a basis for the internal parts. Finally, in the upper Jurassic, it frees itself from the pedicle, and in the form

of *Comatula*, enjoys the faculty of locomotion. The *Comatula* and *Pentacrinus Caput-Medusae* are the only living representatives of the Order. The Cystids, as also the Blastoids—another little group of Palæozoic Echinoderms,—have been separated from the true Crinoids into distinct Orders; but we shall include them under this head.

No. 864. **Actinocrinus proboscidialis,** Hall.

The Actinocrinoids, found chiefly in the Carboniferous limestone, are sometimes provided with thorn-like side arms which project from the column at irregular distances. The receptacle is of an irregular subspherical form, and frequently having arms passing off at right angles like the spokes from the nave of a wheel. This species is from the Burlington limestone (Carboniferous),Burlington, Iowa. Price, $0.15.

No. 865. **Actinocrinus aequalis,** Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 866. **Actinocrinus æquibrachiatus,** McChesney.
From the Burlington limestone (Carboniferous), Monmouth, Ill.
Price, $0.15.

No. 867. **Actinocrinus Agassizi,** Troost.
From the Keokuk limestone (Carboniferous), Crawfordville, Ind.
Price, $0.30.

No. 868. **Actinocrinus althea,** Hall.
From the Burlington limestone (Carboniferous), Burlington, Iowa.
Price, $0.25.

No. 869. **Actinocrinus biturbinatus,** Hall.
Body and arms. From the Keokuk limestone (Carboniferous) Crawfordville, Ind. Price, $0.25.

No. 870. **Actinocrinus cornigerus,** Hall.
From the Burlington limestone (Carboniferous), Burlington, Iowa.
Price, $0.20.

No. 871. **Actinocrinus formosus,** Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 872. **Actinocrinus Fosteri,** McChesney.
From the same formation and locality as the preceding. Price, $0.15.

No. 873. **Actinocrinus Gouldi,** Hall.
From the Keokuk limestone (Carboniferous) Warsaw, Ill. Price, $0.30.

No. 874. **Actinocrinus jugosus**, Hall.
From the Keokuk limestone (Carboniferous), Keokuk, Iowa. Price, $0.40.

No. 875. **Actinocrinus lobatus**, Hall.
From the same formation and locality as the preceding. Price, $0.35.

No. 876. **Actinocrinus Lowei**, Hall.
From the same formation and locality as the preceding. Price, $0.40.

No. 877. **Actinocrinus longirostris**, Hall.
From the Burlington limestone (Carboniferous), Burlington, Iowa.
Price, $0.15.

No. 878. **Actinocrinus liratus**, Hall.
From the same formation and locality as the preceding. Price, $0.30.

No. 879. **Actinocrinus multiradiatus**, Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 880. **Actinocrinus Nashvillæ**, Troost.
Body and stem. From the Keokuk limestone (Carboniferous), Warsaw, Ill.
Price, $0.50.

No. 881. **Actinocrinus pernodosus**, Hall.
From the Keokuk limestone (Carboniferous), Warsaw, Ill. Price, $0.30.

No. 882. **Actinocrinus regalis**, Hall.
From the Burlington limestone (Carboniferous), Burlington, Iowa.
Price, $0.30.

No. 883. **Actinocrinus senarius**, Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 884. **Actinocrinus sinuosus**, Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 885. **Actinocrinus superlatus**, Hall.
From the same formation and locality as the preceding. Price, $0.25.

No. 886. **Actinocrinus subumbrosus**, Hall.
From the same formation and locality as the preceding. Price, $0.25.

No. 887. **Actinocrinus tenuiradiatus**, Hall.
Body and stem. From the same formation and locality as the preceding.
Size, 6 x 8. Price, $0.60.

No. 888. **Actinocrinus Thoas**, Hall.
From the same formation and locality as the preceding. Price, $0.35.

No. 889. **Actinocrinus tenuisculptus**, Mc Chesney.
From the same formation and locality as the preceding. Price, $0.15.

No. 890. **Actinocrinus umbrosus**, Hall.
From the same formation and locality as the preceding. Price, $0.25.

No. 891. **Actinocrinus umbrosus,** Hall.
Another variety; same formation and locality. Price, $0.20.

No. 892. **Actinocrinus verrucosus,** Hall.
From the same formation and locality as the preceding. Price, $0.15.

No. 893. **Agaricocrinus tuberosus,** Troost.
This generic name was proposed by Dr. Troost in 1850, for certain mushroom-shaped Crinoids, which, in the number and arrangement of the body-plates, present considerable analogy with *Actinocrinus*. The typical species is *A. Americanus*, Roemer, with which this is identical. From the Keokuk limestone (Carboniferous), Warsaw, Ill. Price, $0.30.

No. 894. **Agaricocrinus Whitfieldi,** Hall.
From the same locality as the preceding. Price, $0.25.

No. 895. **Agaricocrinus Wortheni,** Hall.
With arms free. From the same locality as the preceding. Price, $0.50.

No. 896. **Agelocrinus Kaskaskiensis,** Hall.
This generic name was given by Vanuxem to include star-like Crinoids "clustering together so as to form one system." It is now known that they are Cystideans of a very remarkable type, being destitute of a stem. The general form of the calyx is hemispherical. This specimen is from the Chester limestone (Carboniferous), Kaskaskia, Ill. Price, $0.30.

No. 897. **Ancyrocrinus spinosus,** Hall.
The Crinoids of this genus were probably free when adult. They have the form of a bulb or thickened column, with lateral ascending processes and a central ascending column. This specimen is from the limestone of the Upper Helderberg (Devonian), Falls of the Ohio. Price, $0.25.

No. 898. **Apiocrinus Parkinsoni,** Schloth.
Two bodies and two stems branching from one root; young. The "Pear-encrinites" have a complicated, expanded root, a long column composed of numerous ossicles, and a pyriform receptacle, with arms well developed and regularly bifid. In this species, the stem is comparatively short. This specimen is from the Great Oolite, Bradford, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 6 x 8. Price, $1.25.

No. 899. **Apiocrinus Parkinsoni,** Schloth.

This specimen, representing body, stem and root, is from the Great Oolite, Bradford, England, and is now in the Ward Museum, University of Rochester.

Size, 9 x 3. Price, $1.25.

No. 900. **Apiocrinus Parkinsoni,** Schloth.

The several hundred pieces of body and arms, dissected and spread out on a slab. From the same locality and Cabinet as the preceding.

Size, 12 x 12. Price, $2.00.

No. 901. **Apiocrinus Parkinsoni,** Schloth.

An unusually large specimen, showing the body deeply excavated on its upper surface for the attachment of the arms. The root, also, has a great development. The stem is made up from several fragments, and is doubtless too short. From the same locality and Cabinet as the preceding.

Size, 11 x 4. Price, $1.60.

No. 902. **Aspidocrinus digitatus,** Hall.

The specimens referred to this genus present themselves as broad scuttelliform bases of Crinoids, or sometimes nearly hemispheric in shape. The radial plates and arms are unknown. From the Lower Helderberg (Devonian), Schoharie Co., N. Y. Price, $0.25.

No. 903. **Astrios ——,** Troost.

This name, by an erroneous determination, was given by Troost to a silicified filling of an abnormal development of a portion of a Crinoid stem. From the Drift, near New Albany, Indianapolis. Price, $0.70.

No. 904. **Astrocoma Cirini,**

This beautiful Comatula, with its numerous arms gracefully spread out, is from the Lithographic limestone (Middle Oolite), Cirin, France.

Size, 7 x 4. Price, $1.00.

No. 905. **Brachiocrinus nodosarius,** Hall.

Two specimens on slab. The body of this Crinoid is unknown. The arms are very long, and composed of numerous articulations arranged in single, consecutive series, with tentacles made up of bead like joints. From the Lower Helderberg (Upper Silurian), Schoharie, N. Y. Price, $0.60.

No. 906. **Brachiocrinus nodosarius,** Hall.

A specimen with tentacles more closely arranged than usual. From the same locality as the preceding. Price, $0.30.

No. 907. **Cacabocrinus sculptilis,** Troost.

Body. This genus (*Dolatocrinus* of Lyon) is characterized by a round column composed, near the body, of alternate large and small pieces, three basal plates, first, second and third radials, hexagonal, quadrangular and pentagonal respectively, and ten arms tapering rapidly. From the Upper Helderberg (Devonian), Stuart Co., Tennessee. Price, $0.30.

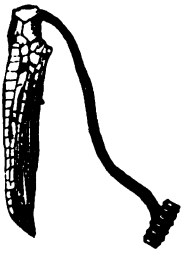
No. 908. **Caryocrinus ornatus,** Say.

Body with column. The Caryocrinoids are called by Pictet, Cystideans; but they are commonly placed among the true Crinoids, though differing from them in having four pelvic and six costal plates. The column is round, composed near the body of larger and smaller joints alternating with each other. The name of this genus is derived from the nut-like shape of the body. This specimen is from the Niagara group (Upper Silurian), Lockport, N. Y. Price $0.60.

No. 909. **Caryocrinus ornatus,** Say.

Very perfect specimen, beautifully marked. From the same locality as the preceding. Price, $0.40.

No. 910. **Cheirocrinus clarus,** Hall.



Body, arms and stem. The body of this Crinoid is a little flattened on the dorsal side below, and expands slightly above; the column is short—the lower joints being longer than those above; and the basal plate is concave. This specimen is attached by a spreading root to the fragment of another Crinoid column. From the Hamilton group (Devonian), Ontario Co., N. Y. Price, $0.40.

No. 911. **Crotalocrinus rugosus,** Miller.

Body, stem and root, on pedestal. This ancient Crinoid is so called from its peculiar shape and structure. The sub-divisions of the arms begin at the very edge of the cup, and become so numerous as to form a perfect network in the shape of a convoluted funnel-like organism of the finest basket-work, instead of the rayed arrangement of the common Encrinite. The stem is made up of tuberculated joints. From the Upper Silurian, Dudley, England.

Size, 18 x 2. Price, $1.50.

No. 912. **Cupellacrinus magnificus,** Troost.

This is a sub-genus of *Platycrinus*. It has three basal, and ten radial plates, and ten arms. From the Upper Helderberg (Devonian), Decatur Co. Tenn. Price, $0.80.

No. 913. **Cyathocrinus Hoveyi,** Hall.

The body of this Crinoid has three series of five plates, the last with five intercalated pieces. From the Keokuk limestone (Carboniferous), Crawfordsville, Ind. Price, $0.40.

No. 914. **Cyathocrinus multibrachiatus,** Lyon and Cassedy.

From the same locality as the preceding. Price, $0.25.

No. 915. **Cyathocrinus ornatissimus,** Hall.

Several bodies on slab. From the Portage group (Devonian), shore of Lake Erie. N. Y. Price, $0.60.

No. 916. **Dorycrinus Mississippiensis,** Roemer.

An Actinocrinoid, according to Shumard. This specimen, showing the body with five arms surrounding the central proboscis, is from the Keokuk limestone (Carboniferous), Warsaw, Ill. Price, $0.75.

No. 917 **Encrinus liliiformis,** Schlotb.

Body and stem, on slab. This beautiful and well known Crinoid has a smooth body in the form of a depressed vase. Its base is composed of five plates, upon which rest three successive series of other plates, with the uppermost of which the arms articulate The stem is long and formed of numerous perforated round ossicles, articulated to each other by radiated grooved surfaces, and becoming somewhat pentangular and alternately larger and smaller towards the summit. This specimen was found in the Muschelkalk (Middle Trias) of Brunswick, Germany, and is now in the Ward Museum of the University of Rochester.

Size, 8 x 2. Price, $1.00.

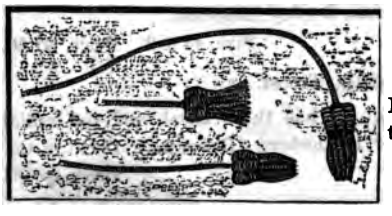
No. 918. **Encrinus liliiformis,** Schloth.

Body. From the same locality and Cabinet as the preceding. Price, $0.30.

No. 919. **Encrinus liliiformis,** Schloth.

This specimen, one of the finest ever discovered, is a slab containing seven bodies and stems. It is from the same locality as the preceding, and is now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 17 x 9. Price, $3.00.

No. 920. **Encrinus liliiformis,** Schloth.



Slab with three bodies and stems. From the same locality and Cabinet as the preceding. Size, 18 x 9. Price, $2.00.

No. 921. **Eucalyptocrinus crassus,** Hall.

This genus, created by Goldfuss, is characterized by an ovoid and very complicated body; five hexagonal pelvic plates, succeeded by the same number of quadrangular costal plates and pentagonal scapular plates,—each scapular plate supporting a pair of arm-joints. The column is round, composed of thicker and thinner joints alternating. This beautiful and perfect specimen—showing body, stem and root, is from the Niagara group (Upper Silurian), Waldron, Ind.

Size, 8 x 3. Price, $0.30.

No. 922. **Eucalyptocrinus crassus,** Hall.

Two specimens. From the same locality as the preceding. Pric, $0.60

No. 923. **Eucalyptocrinus crassus**, Hall.

Roots, forming the base of the stem. From the same locality as the preceding. Price, $0.40.

No. 924. **Eucalyptocrinus ovalis**, Troost.

Body and stem. From the same locality as the preceding. Price, $0.35.

No. 925. **Forbesiocrinus Agassizi**, Hall.

The Crinoids of this genus (or rather sub-genus of *Taxocrinus*) have three basal plates, and five sub-radials; four radial plates for each ray, and numerous inter-radials. From the Burlington limestone (Carboniferous), Burlington, Iowa. Price, $0.50.

No. 926. **Forbesiocrinus ramulosus**, Lyon and Cass.

Specimen showing stem, body and branching arms. From the Keokuk limestone (Carboniferous), Crawfordsville, Ind. Price, $0.35.

No. 927. **Forbesiocrinus Wortheni**, Hall.

From the Keokuk limestone (Carboniferous), Keokuk, Iowa. Price, $0.50.

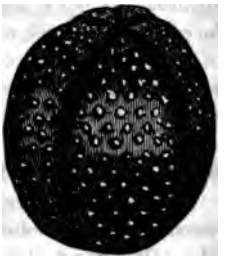
No. 928. **Glyptaster brachiatus**, Hall.

This genus is closely allied to *Glyptocrinus*. In this specimen, the arms are free, and spread out on the surface of the stone, showing their under side. From the Niagara limestone (Upper Silurian), Lockport, N. Y. Price, $0.40.

No. 929. **Glyptocrinus decadactylus**, Hall.

This Crinoid has a cup-shaped body with ten arms, which support twenty tentaculated fingers. There are five pentagonal basal and five heptagonal sub-radial plates, succeeded by five more sub-radials and as many radials. Strong radiating ridges mark the surface of all the plates below the fingers. The column is generally wanting. From the Hudson River group (Lower Silurian), Cincinnati, O. Price, $0.15.

No. 930. **Granatocrinus cidariformis**, Troost.



This type of the genus is the *Pentremites granulatus*, Roemer. It is an elliptical Blastoidean, and has elongated radial plates and short inter-radials. From the Kaskaskia limestone (Carboniferous), Tennessee. Price, $0.25.

No. 931. **Holocystites cylindricus**, Hall.

This new Cystidean was found in the Niagara limestone (Upper Silurian), Racine, Wisconsin. Price, $0.25.

No. 932. **Ichthyocrinus lævis,** Conrad.

This interesting fossil, related to *Cycathocrinus*, has five triangular basal plates, and a round, smooth, slender column, enlarging towards the cup. The body has an undeveloped tripetaloid base. This specimen, showing body and stem, is from the Niagara shale (Upper Silurian), Lockport, N. Y. Price, $0.40.

No. 933. **Ichthyocrinus lævis,** Conrad.

Body and arms; same locality. Price, $0.40.

No 934. **Lecanocrinus macropetalus,** Hall.

This Crinoid differs chiefly from *Ichthyocrinus* in having three basal plates instead of five. It may be a further development of the type first appearing in *Ichthyocrinus*. From the Niagara shale (Upper Silurian), Lockport, N. Y. Price, $0.20.

No. 935. **Lampterocrinus Tennesseensis,** Roemer.

This fossil, the *Balanocrinus sculptus* of Troost, unites the pear-shaped body of *Apiocrinus* with the stem of *Pentacrinus*. From the Niagara limestone (Upper Silurian), Decatur County, Tennessee. Price, $0.25.

No. 936. **Lepadocrinus (Apiocystites) Gebhardi,** Conrad.

This Cystidean has an oblong, oval body, compressed at the sides, four unequal basal plates, four arms, and a column of two distinct parts,—the upper being flexible, the lower, larger, longer, and inflexible. This specimen, showing the body, with a short stem, is from the Lower Helderberg (Upper Silurian), Schoharie County, N. Y. Price, $0.25.

No. 937. **Lyriocrinus (Rhodocrinus) dactylus,** Hall.

Body and arms. This species, allied to *Cyathocrinus*, has five pentagonal basal plates, five sub-radials, and five basals. The column is round, composed at the top of alternating larger and smaller joints. From the Niagara shale (Upper Silurian), Lockport, N. Y. Price, $0.30.

No. 938. **Mariacrinus nobilissimus,** Hall.

This species, constituting the type of this genus, is one of the largest and finest known Crinoids in the Silurian system. It bears a general resemblance to *Glyptocrinus;* but it has four basal plates, three pentagonal and one hexagonal The column is round, consisting of joints, gradually growing thinner towards the body. A remarkable feature is that the main arms give origin to armlets or fingers which bear the tentacles. This magnificent specimen of a nearly entire individual is from the Lower Helderberg (Upper Silurian), Litchfield, N. Y. Price, $0,75.

No. 939. **Megistocrinus Knappi,** Lyon and Cass.

A sub-genus of *Actinocrinus*. The body is large, broadly spreading, with depressed dome; the column is round, with unequal joints. From the Upper Helderberg (Devonian), Falls of Ohio. Price, $0.30.

No. 940. **Megistocrinus Ontario,** Hall.

Body and branching arms. From the Hamilton shales (Devonian), Western New York. Price, $0.50

No. 941. **Nucleocrinus Verneuili,** Troost.

This Blastoidean has an ovoid body, supported by a slender column, three minute basal plates, five radials, and six inter-radials. From the Upper Helderberg (Devonian), Falls of Ohio. Price, $0.20.

No. 942. **Pentacrinus subangularis,** Miller.

Body and stem, on slab. (Syn. *P. fasciculosus*, Schloth.) In the Pentacrinoids, the body-plates are firmly articulated together; the rays of the disc are fixed immediately to the summit of the column by special ossicles; and the stem is composed of angular pieces, generally pentagonal. The arms are very long, and thickly beset with side-arms and minute pinnæ. This specimen, of unusual size and perfection, is from the Lias, Boll, Wirtemberg. Size, 4 ft. 5 in. x 1 ft. 6 in. Price, $4.50.

No. 943. **Pentacrinus subangularis,** Miller.

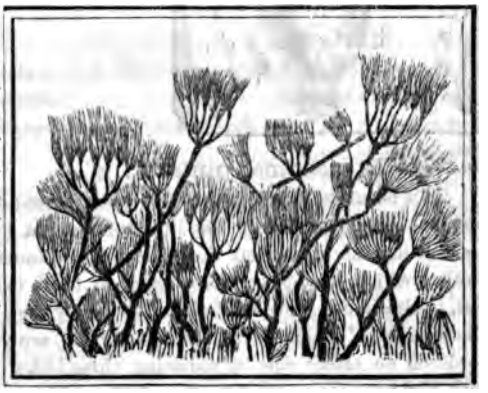
Body and stem, on slab. From the Lias, Boll, Wirtemberg, and is now in the Ward Museum, University of Rochester. Size, 13 x 12. Price, $1.75.

No. 944. **Pentacrinus basaltiformis,** Miller.

A slab covered with numerous segments of stems. These various segments of the stem of a typical species show well the pentagonal form of the stem and the star-like radiation of the inner structure displayed on the free ends.

Price, $0.75.

No. 945. **Pentacrinus (Extracrinus) Briareus,** Miller.



The Extracrinoids of Aus tin are Pentacrinoids with unequal radial plates. This slab, containing a multitude of beautifully preserved bodies, is from the Lias of Whitby, England, and is now in the Ward Museum, University of Rochester. Size, 2 ft. 2 in. x 1 ft. 10 in.

Price, $7.00.

No. 946. **Pentacrinus colligatus,**

Two heads on slab, each over two feet in diameter! From the Coral Rag (Middle Oolite), Streitberg, Germany. Size, 4 ft. x 3 ft. 4 in. Price, $8.00.

No. 947. **Periechocrinus moniliformis,** Miller.

Body, arms and stem. This beautiful Actinocrinoid is from the Upper Silurian of Dudley, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 9 x 8. Price, $1.50.

No. 948. **Periechocrinus moniliformis,** Miller.

Body, arms and stem; same locality and Museum. Size, 9 x 7. Price, $1.50.

No. 949. **Pentremites pyriformis,** Say.

Body and column. This Blastoid has a body composed of polygonal plates, divided by five perforated grooves; a short column, formed of cylindrical, perforated ossicles with radiated surfaces; and irregular side-arms. From the Chester limestone (Carboniferous), Pope Co., Ill. Price, $0.20.

No. 950. **Pentremites pyriformis,** Say.

From the Chester limestone (Carboniferous), Sequatchie Valley, Tenn. Price, $0.20.

No. 951. **Pentremites cervinus,** Hall.

From the Chester limestone (Carboniferous), Chester, Ill. Price, $0.15.

No. 952, **Platycrinus regalis,** Hall.

The typical *Platycrinus* have three basal plates, and sometimes terminate upwards in a long proboscis. This head, with branching arms, is from the Burlington limestone (Carboniferous), Burlington, Iowa. Price, $0.40.

No. 953. **Platycrinus Sarae,** Hall.

Body, arms and stem. From the St. Louis limestone (Carboniferous), St. Louis, Mo. Price, $0.50.

No. 954. **Pterocoma pinnata,** Agass.

This beautiful Crinoid (the *Comatula pinnata* of Goldfuss) is a fossil of very frequent occurrence in the fine limestone strata left by the ancient Solenhofen sea. It had no stem, but the younger specimens show certain faint traces of rootlets which perhaps anchored them in their early age. The body, or central disc, is almost nul, and absorbed, as it were, by the great development of the arms. These arms, of which there are usually ten, are very long and slender, and are bordered on either side by radiating, thread-like, side-arms or tentaculæ which span the intervening space with a delicate fringe. The majority of the individuals found are much distorted, and their arms tangled and broken by the action of the waves before they were buried in the mud. From the Lithographic Limestone (Middle Oolite) of Solenhofen, Bavaria, and now in the Ward Museum of the University of Rochester. Size, 9 x 6. Price, $1.25.

No. 955. **Scaphiocrinus æqualis,** Hall.
Sub-genus of *Poteriocrinus.* Body and branching arms, from the Keokuk limestone (Carboniferous), Crawfordsville, Ind. Price, $0.25.

No. 956. **Scaphiocrinus unicus,** Hall.
Body, with branching arms; same locality. Price, $ 0.25

No. 957. **Trematocrinus tuberculosus,** Hall.
(Syn. *Goniasteroidocrinus,* Lyon and Cass., and sub-genus of *Rhodocrinus.*) From the Burlington limestone (Carboniferous), Burlington, Iowa.
Price, $0.25.

No. 958. **Trematocrinus typus,** Hall.
From the same formation and locality as the preceding Price, $0.20.

No. 959. **Woodocrinus decadactylus,** Koninck.
This Crinoid closely resembles *Cyathocrinus.* This slab, with body and stem of one specimen, and other stems, is from the Carboniferous limestone, Yorkshire, England.
Size, 14 x 8. Price, $1.50.

No. 960. **Woodocrinus decadactylus,** Kon.
Body and stem on slab. From the same locality as the preceding.
Size, 13 x 7. Price, $1.25.

No. 961. **Zeacrinus elegans,** Hall.
Body and arms. From the Burlington limestone (Carboniferous), Burlington, Iowa, Price, $0.25.

The entire Suite of Crinoidea—Nos. 864–961,—includes 80 species and 40 genera, represented by 100 specimens. Price, packed, $70.00.

Omitting the three largest specimens—Nos. 942, 945, and 946, the price will be, packed, Price, $50.00.

CLASS II.—ACALEPHÆ.

These soft, gelatinous Radiates, known as "Jelly-fishes," "Sea-nettles," "Sea-blubbers," "Medusae," etc., vary in size from an almost invisible dot to a yard in diameter. Large ones often weigh 50 lbs.; yet they are little more, as it were, than "coagulated water," for when dried, nothing is left but a film of membrane, thin as gossamer, and weighing but a few grains. The animal is covered by a very delicate epidermis, under which are situated the nettling capsules. There is a distinct muscular system; but the only motion observed consists of an alternate contraction and dilatation of the disc, performed with great regularity about fifteen times a minute.

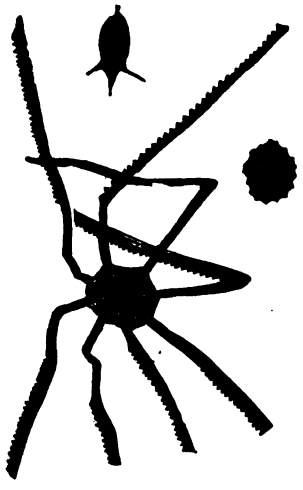
Acalephs have left few traces in stratified deposits, owing to the extraordinary softness of their bodies. According to Agassiz, *Favosites* and *Chætetes* belong to this class; and it is quite possible, says Dana, that most of the so-called *Graptolites* are Acalephs.

No. 962. **Acalepha deperdita,** Bey.

Two specimens. The remains of this frail creature are circular imprints, composed of very regular concentric circles, on the borders of which are eight rays. These are the only sure remains of a true Acaleph which have been found fossil. From the Lithographic limestone (Middle Oolite), Eichstädt, Bavaria.

Price, $0.75.

No. 963. **Graptolithus octobrachiatus,** Hall.



The Graptolites were first considered of vegetable origin; subsequently they were regarded as extremely slender Orthoceratites; but Portlock has pointed out their analogy with *Sertularia* or the lowest forms of Acalephs. They consist of sessile polype cells arranged in one or two rows on flexible, tubular stems which radiate from a central disc. The specimens usually observed are fragments of stems in a flattened condition, presenting only a serrated edge; they seldom preserve more of their substance than a carbonaceous or corneous film of extreme tenuity. Graptolites are exclusively and characteristically Silurian fossils, and prevail in argillaceous deposits. This specimen is an artificial representation (it being quite impossible to take a cast of the delicate original) of an eight-armed Graptolite from the Quebec group as figured by

Hall. The smaller specimens are individuals, probably of the same species, which have not their full development, nor even. (save in the one which still lacks a central disc) the full number of arms. The two smallest figures represent the germs of two distinct species of Graptolites.

Size, 7 x6. Price, $0.60.

CLASS III.—POLYPI.

These soft bodied, aquatic Zoöphytes, represented by the fresh-water Hydras and the Sea-Anemones and Corals of the ocean, have cylindrical, oval and oblong bodies, with an aperture at one end which is surrounded by a coronet of tentacles. From the inner surface project radiating partitions, leaving an open space in the centre. The Corals have the power of secreting a corrallum; and this secretion is as truly internal as the bones of the Vertebrates. It exactly copies the animal: the rays correspond to the partitions, and the tubular cavity to the space occupied by the stomach. Corals usually live in colonies, or as one compound body, attached by a common base to some support, and increase by budding. This physiological relation occasions remarkable grouping: hence the stupendous results in tropical seas, by which the life of the individual is combined with the life of the whole, and the nutriment prepared by each organism is made to contribute to the nourishment of the community of which it forms a part.

True Coral animals of the sea (the Cyathophylloids chiefly) first appeared in the Trenton Period. The lamelliferous or stony Corals were perhaps most widely diffused and individually abundant in the Silurian age. There is a Palæozoic and a Neozoic type of Coral. In the former there is a quadripartite arrangement of the plates; in the latter, the number is some multiple of six. The Secondary Corals more resemble living species of the tropics. Of the 1265 fossil Corals enumerated by D'Orbigny, 1001 are Neozoic. The outer form of the Corralum, or coral-stock, varies between very great extremes (of lengthening, shortening, flatness, sphericity, &c.) in different individuals of the same genus and species. This fact, and the impossibility of well preserving the delicate, characterizing plates of their inner portions, displayed upon the upper surface, makes it difficult to give any satisfactory series of casts of them.

FIFTH SUB-KINGDOM.

PROTOZOA.

The division of Protozoa, created by Von Siebold in 1845, has been extensively adopted by naturalists as a convenient receptacle for many forms of animal life which do not fall into any one of the four great Sub-kingdoms established by Cuvier. Their bodies, composed of a peculiar semi-gelatinous substance called "sarcode," possess neither muscular nor nervous tissue, and the circulatory and digestive systems are most feebly defined. A large proportion of these organisms consist simply of cells, single or agglomerated.

Naturalists entertain many and widely diverse views as to the legitimacy of the group, or its value, if allowed. Agassiz does not recognize the Protoza as a distinct branch of the Animal Kingdom; while Owen takes the bold step of creating for their reception a third primary division of the organic world, intermediate between animals and plants. With the majority of comparative zoölogists, however, the group is gaining ground, although much has yet to be done towards the attainment of a perfect knowledge of their structure and development before their limits can be well defined, or a good classification can be attempted. The three more commonly recognized Classes are: *Infusoria*, *Rhizopoda* and *Porifera*.

CLASS I.—INFUSORIA.

These animalcules were first observed by Lœwenhöck in 1675; and our present knowledge is chiefly due to the labors of Ehrenberg, Pritchard, Dujardin and Bailey. The later researches have tended to

diminish the numbers of the so-called Infusoria; many forms have been shown to be only larval worms, while whole genera (as *Diatomaciæ* and *Bacillariæ*) have assumed under the microscope a vegetable character. Siebold distinguishes them from Rhizopods by their having bodies of a definite form, and by moving chiefly by means of vibratile organs, instead of prolongations and digitations of the sarcode.

Infusoria inhabit both fresh and salt waters, and are all recent,—the fossil organisms often called Infusorial being Foraminifers, Polycystins and Diatoms.

CLASS II.—RHIZOPODA.

These Protozoans are mostly microscopic, and consist of one or more cells,—the compound kinds taking fanciful shapes. Each cell is occupied by a separate animal or zooid (except in the *Orbitolites*), though they are organically connected. The animal is of the simplest form possible, having no permanent mouth, stomach or members. It is a gelatinous, fleshy, somewhat granular substance, without appreciable organization. From this body are thrown out at will long, delicate, contractile filaments, resembling roots (whence the name Rhizopod), which are used like the tentacles of the Polyp for locomotion, and for the introduction of food. The majority have the power of secreting a testaceous envelope, either siliceous or calcareous; a few are naked; while fewer still are strengthened like the Sponge by spicula. The Class is divided by Carpenter, according to structural characters, into three orders: *Lobosa*, (as the changeful *Amœbæ*), *Radiolaria*, (as the silicious-shielded *Polycystiniæ*—best known as the "Fossil Infusoria of Barbadoes,") and *Reticulosa*. The Protozoans of the last Order are generally enclosed in calcareous shells, and constitute the interesting group of *Foraminifera*. The existence of these microzoa was first made known to naturalists by Beccarius nearly 150 years ago. They were first ranked as minute forms of Nautili, and even D'Orbigny, in his first memoir (1825), described them as Cephalopods. It was reserved for Dujardin, ten years after, to demonstrate their Rhizopod type of structure. Since then our knowledge has been greatly extended by the elaborate researches of Williamson and Carpenter.

The Foraminifer is a marine animal, dwelling in a shell of extreme beauty, sometimes simple, but usually consisting of an aggregate of chambers which intercommunicate by minute apertures, whence the name. These chambers grow by successive gemmation from a primor-

dial segment, sometimes in a straight line, more commonly in a spiral or discoidal form. It is usually a sedentary organism, being fixed by the adhesion of the shell to the surface of Algæ, Zoöphytes, Molluscs, etc. D'Orbigny's classification, founded on the numerical increase of the chambers, has been set aside. Carpenter divides the Order into two primary groups according as the envelope is *perforated* or *imperforated*. The former include a large proportion of the Foraminifers which come under general observation, namely, the three families, *Lagenida*, *Globigerinida*, and *Nummulinida*. They are characterized by a calcareous shell perforated by tubular openings. The extraordinary multiplication of Nummulites in the Eocene gives the last family a place of no mean importance as a member of its fossil fauna. The imperforated Foraminifers include the families, *Gromida*, *Miliolida*, and *Lituolida*, in which the nature of the envelope is membranous, porcellanous and arenaceous. The *Miliola* is now the most universally diffused Foraminifer; its type can be traced back to the Lias.

Upwards of 657 fossil species of Foraminifera, belonging to 73 genera, have been described. They commence in the Palæozoic age, increase in number and variety with each successive stratum, and attain their maximum in the present seas. Indeed, they are so abundant in the most common materials, as chalk for example, as to justify the expression of Buffon, that the very dust had been alive. The calcaire grossier—the building stone of Paris, and the material of the Pyramids, are full of these minute chambered shells; while the deep-sea soundings of the Atlantic Telegraph Company show that the bed of the Ocean is composed of little else than the shells of *Globigerinæ* and the shields of *Polycystinæ*.

1. Sub-Order, Foraminifera perforata.

Nummulinida.

No. 964. **Amphistegina Lessonii**, D'Orb.
Living: Isle of France.

No. 965. **Amphistegina Quoyi**, D'Orb.
Living: Isle of Rawak, Pacific.

No. 966. **Amphistegina vulgaris**, D'Orb.
Miocene: Bordeaux, France.

No. 967. **Cuneolina pavonia**, D'Orb.
Upper Greensand: Isle Madame, France.

No. 968. **Fusulina cylindrica**, D'Orb.
Carboniferous: Russia, Belgium, Ohio, Nebraska.

No. 969. **Heterostegina costata**, D'Orb.
Miocene: Nussdorf, Austria.

No. 970. **Heterostegina costata**, D'Orb.
(Variety.) Miocene: Nussdorf, Austria.

No. 971. **Heterostegina depressa**, D'Orb.
Living: St. Helena.

No. 972. **Nonionina communis**, D'Orb.
Miocene: Bordeaux, France. Living: Madagascar and Adriatic.

No. 973. **Nonionina limba**, D'Orb.
Living: Adriatic.

No. 974. **Nonionina sphœroides.**
Living.

No. 975. **Nonionina umbilicata**, D'Orb.
Pliocene: Sienna, Italy, and Bordeaux, France. Living: Adriatic.

No. 976. **Nummulina discoidalis**, D'Orb.
Living: Isle of Rawak, Pacific.

No. 977. **Nummulina planulata**, D'Orb.
Eocene: Cuisse Lamothe, France.

No. 978. **Operculina complanata**, D'Orb.
Miocene: Bordeaux, France.

No. 979. **Operculina ——.**
Living: Philippine Islands.

No. 680. **Polystomella aculeata**, D'Orb.
Miocene: Baden, Austria.

No. 981. **Polystomella crispa**, Lam.
Miocene: Vienna, Austria. Pliocene: Sienna, Italy. Living: Bay of Biscay and Mediterranean.

Globigerinida.

No. 982. **Allomorphina cretacea**, Reuss.
Upper Greensand: Lemberg, Austria.

No. 983. **Anomalina elegans**, D'Orb.
Miocene: Bordeaux, France.

No. 984. **Asterigerina planorbis**, D'Orb.
Pliocene: Nussdorf, Austria.

No. 985. **Asterigerina rosacea**, D'Orb.
Miocene: Bordeaux, France.

No. 986. **Ataxophragmium variabile**, D'Orb. (*α*)
Upper Chalk: Meudon, France.

No. 987. **Ataxophragmium variabile**, D'Orb. (*β*)
Upper Chalk: Meudon, France.

No. 988 **Bigenerina nodosaria**, D'Orb.
Living: Adriatic.

No. 989. **Bolivina Beyrichi**, Reuss.
Lower Miocene: Austria.

No. 990. **Bulimina caudigera**, D'Orb.
Living: Adriatic.

No. 991. **Bulimina elegans**, D'Orb.
Living: Adriatic.

No. 992. **Bulimina Presli**, Reuss.
Chalk: Germany.

No. 993. **Bulimina pupoides**, D'Orb.
Miocene: Baden, Austria.

No. 994. **Bulimina pyrula**, D'Orb.
Miocene: Vienna, Austria.

No. 995. **Calcarina bisaculeata**, D'Orb.
Living: Mediterranean.

No. 996. **Calcarina calcar**, D'Orb.
Living: Madagascar and Antilles.

No. 997. **Cassidulina crassa**, Reuss.
Living.

No. 998. **Cassidulina lævigata**, D'Orb.
Living: Mediterranean.

No. 999. **Cassidulina serrata.**
Miocene: Austria.

No. 1000. **Chilostomella ovoidea**, Reuss.
Lower Miocene: Vienna, Austria.

No. 1001. **Chrysalidina gradata**, D'Orb.
Chalk: Isle Madame, France.

No. 1002. **Clavulina communis**, D'Orb.
Pliocene: Nussdorf, Austria.

No. 1003. **Clavulina Parisiensis**, D'Orb.
Eocene: Mouchy-le-Chatel, France.

No. 1004. **Conulina conica**, D'Orb.
Living.

No. 1005. **Cyclolina cretacea**, D'Orb.
Upper Greensand: Isle Madame, France.

No. 1006. **Globigerina bulloides**, D'Orb.
(Young.) Miocene: Austria. Pliocene: Italy. Living: Adriatic.

No. 1007. **Globigerina bulloides**, D'Orb.
(Older.) Miocene: Austria. Pliocene: Italy. Living: Adriatic.

No. 1008. **Globigerina bulloides**, D'Orb.
(Adult.) Miocene: Austria. Pliocene: Italy. Living: Adriatic.

No. 1009. **Justulina Austriaca**, Reuss.
Miocene: Austria.

No. 1010. **Orbulina universa**, D'Orb.
Miocene: Vienna, Austria. Living.

No. 1011 **Ovulites elongata**, Lam.
Eocene: Grignon, France.

No. 1012. **Ovulites margaritula**, Lam.
Eocene: Grignon, France. Miocene: St. Domingo.

No. 1013. **Planorbulina Mediterranensis**, D'Orb.
Living: Mediterranean.

No. 1014. **Planorbulina nitida**, D'Orb.
Living: Bay of Biscay.

No. 1015. **Proroporus complanatus**, Reuss.
Gault.

No. 1016. **Pullenia bulloides**, D'Orb.
Pliocene: Vienna, Austria. Living: Mediterranean.

No. 1017. **Pullenia lævis**, D'Orb.
Eocene: Mouchy-le-Chatel, France.

No. 1018. **Rotalia Ariminensis**, D'Orb.
Living: Adriatic.

No. 1019. **Rotalia armata**, D'Orb.
Miocene: Chavagnes, France. Living: Cayenne and Martinique.

No. 1020. **Rotalia Beccarii**, D'Orb.
Living: Bay of Biscay and West Indies.

No. 1021. **Rotalia Brongniarti**, D'Orb.
Miocene: Castel-Arquato, Italy. Living.

No. 1022. **Rotalia bulimoides**, Reuss.
Lower Miocene: Germany.

No. 1023. **Rotalia corallinarum**, D'Orb.
Living: Bay of Biscay.

No. 1024. **Rotalia Gervillii**, D'Orb.
Eocene: Valognes, France.

No. 1025. **Rotalia Girardana**, Reuss.
Lower Miocene: Germany.

No. 1026. **Rotalia globularis**, D'Orb.
Living: Bay of Biscay.

No. 1027. **Rotalia Menardii**, D'Orb.
Living: Adriatic.

No. 1028. **Rotalia orbicularis**, D'Orb.
Living: Adriatic.

No. 1029. **Rotalia Parisiensis**, D'Orb.
Eocene: Grignon, France.

No. 1030. **Rotalia pulchella**, D'Orb.
Living: Adriatic.

No. 1031. **Rotalia punctata**, D'Orb.
Living: Adriatic.

No. 1032. **Rotalia rosea**, D'Orb.
Living: West Indies.

No. 1033. **Rotalia Soldanii**, D'Orb.
Miocene: Vienna, Austria. Pliocene: Sienna, Italy. Living: Adriatic.

No. 1034. **Rotalia turbo**, D'Orb.
Eocene: Paris, France.

No. 1035. **Schizophora Neugeboreni**, Reuss.
Miocene: Germany.

No. 1036. **Siderolina calcitrapoides**, Lam. (*a*)
Chalk: Maestricht, Holland.

No. 1037. **Siderolina calcitrapoides**, Lam. (β)
Chalk: Maestricht, Holland.

No. 1038. **Siderolina lævigata**, D'Orb.
Chalk: Maestricht, Holland.

No. 1039. **Siphonina reticulata**, Reuss.
Miocene: Germany.

No. 1040. **Sphæroidina Austriacea**, D'Orb.
Miocene: Nussdorf, Austria.

No. 1041. **Sphæroidina bulloides**, D'Orb.
Pliocene: Sienna, Italy. Living: Adriatic.

No. 1042. **Textularia Capreolus**, Defr.
Living: Adriatic.

No. 1043. **Textularia conulus**, Reuss.
Upper Chalk.

No. 1044. **Textularia digitata**, D'Orb.
Living: Mediterranean.

No. 1045. **Textularia gibbosa**, D'Orb.
Pliocene: Castel-Arquato, Italy. Living: Adriatic.

No. 1046. **Textularia nodosaria**, D'Orb.
Living: Adriatic.

No. 1047. **Textularia pupoides.**
Upper Chalk: Meudon, France.

No. 1048. **Textularia pygmea**, D'Orb.
Living: Adriatic.

No. 1049. **Textularia spinulosa**, Reuss.
Miocene: Germany.

No. 1050. **Tritaxia tricarinata**, Reuss.
Chalk.

No. 1051. **Truncatulina refulgens**, Montague.
Living: Mediterranean and Madagascar.

No. 1052. **Truncatulina tuberculata**, Soldani.
Eocene: Paris, France. Miocene: Bordeaux, France. Pliocene: Castel-Arquato, Italy. Living: Mediterranean and Bay of Biscay.

No. 1053. **Uvigerina pygmea**, D'Orb.
Miocene: Nussdorf, Austria. Pliocene: Sienna, Italy.

No. 1054. **Virgulina squammosa**, D'Orb.
(Adult.) Pliocene: Sienna, Italy.

No. 1055. **Virgulina squammosa**, D'Orb.
(Young.) Pliocene: Sienna, Italy.

No. 1056. **Vulvulina gramen**, D'Orb.
Living: Adriatic and Mediterranean.

Lagenida.

No. 1057. **Amphimorphina Haueri**, Neugeb.
Miocene.

No. 1058. **Cristellaria cassis**, Ficht.
(Adult.) Pliocene: Baden, Austria. Living: Adriatic.

No. 1059. **Cristellaria cassis**, Ficht.
(Young.) Pliocene: Sienna, Italy.

No. 1060. **Cristellaria costata**, D'Orb.
Living: Adriatic.

No. 1061. **Cristellaria cymba**, D'Orb.
Living: Adriatic.

No. 1062. **Cristellaria Italica**, Defr.
(Adult.) Pliocene: Sienna, Italy. Living: Adriatic.

No. 1063. **Cristellaria Italica**, Defr.
(Young.) Pliocene: Sienna, Italy.

No. 1064. **Cristellaria Josephina**, D'Orb.
Miocene: Nussdorf, Austria.

No. 1065. **Cristellaria lævigata**, D'Orb.
Lower Oolite: Caen, France.

No. 1066. **Dentalina acuminata**, Reuss.
Upper Chalk.

No. 1067. **Dentalina Lorneana**, D'Orb.
Upper Chalk.

No. 1068. **Dentalina obliqua**, D'Orb.
Living: Adriatic.

No. 1069. **Dentalinopsis semitriquetra**, Reuss.
Lower Greensand.

No. 1070. **Dimorphina obliqua**, D'Orb.
Miocene: Baden, Austria.

No. 1071. **Dimorphina tuberosa**, D'Orb.
Living: Adriatic.

No. 1072. **Fissurina carinata**, Reuss.
Eocene.

No. 1073. **Flabellina rhomboidalis**, D'Orb.
Living: Adriatic.

No. 1074. **Frondicularia turgida**. Reuss.
Cretaceous): Bohemia.

No. 1075. **Glandulina glans**, D'Orb.
Living: Adriatic.

No. 1076. **Globulina æqualis**, D'Orb.
Pliocene: Nussdorf, Austria.

No. 1077. **Globulina gibba**, D'Orb.
Eocene: Grignon, France. Miocene: Bordeaux, France. Pliocene: Castel-Arquato, Italy. Living: Adriatic.

No. 1078. **Guttulina communis**, D'Orb.
Miocene: Nussdorf, Austria, and Bordeaux, France. Pliocene: Castel-Arquato, Italy. Living: Adriatic.

No. 1079. **Guttulina problema**, D'Orb.
Pliocene: Sienna, Italy.

No. 1080. **Lagena simplex**, Reuss.
Upper Chalk.

No. 1081. **Lagena vulgaris**, Williamson.
Living.

No. 1082 **Lingulina costata**, D'Orb.
Miocene: Nussdorf, Austria.

No. 1083. **Lingulinopsis Bohemica**, Reuss.
Chalk: Bohemia.

No. 1084. **Marginulina bullata**, Röm.
Upper Chalk.

No. 1085. **Marginulina ensis**, Reuss.
Upper Chalk.

No. 1086. **Marginulina glabra**, D'Orb.
Pliocene: Sienna, Italy.

No. 1087. **Marginulina glabra**, D'Orb.
Living: Adriatic.

No. 1088. **Marginulina Raphanus**, Linn.
Pliocene: Castel-Arquato, Italy. Living: Adriatic.

No. 1089. **Nodosaria carinata.**
Pliocene and Living.

No. 1090. **Nodosaria cordata**, Reuss.
Chalk.

No. 1091. **Nodosaria deformis.**
Eocene.

No. 1092. **Nodosaria Goldfussi**, Reuss.
Chalk.

No. 1093. **Nodosaria hasta**, D'Orb.
Living: Adriatic.

No. 1094. **Nodorsaria inflata**, Reuss.
Upper chalk.

No. 1095. **Nodosaria lanceola**, Reuss.
Chalk.

No. 1096. **Nodosaria lepida**, Reuss.
Upper Greensand.

No. 1097. **Nodosaria oblonga**, Reuss.
Eocene.

No. 1098. **Nodosaria radicula**, Lam.
Gault.

No. 1099. **Nodosaria rotulata**, D'Orb.
Chalk: Meudon, France.

No. 1100. **Nodosaria tetragona**, Reuss.
Upper Chalk.

No. 1101. **Orthocerina clavula**, D'Orb.
Eocene: Grignon, France.

No. 1102. **Orthocerina quadrilatera**, D'Orb.
Living: West Indies.

No. 1103. **Pleurostomella fusiformis**, Reuss.
Gault.

No. 1104. **Polymorphina Burdigalensis**, D'Orb.
Miocene: Bordeaux, France.

No. 1105. **Polymorphina complanata,** D'Orb.
Miocene: Nussdorf, Austria.

No. 1106. **Polymorphina Thouini,** D'Orb.
Eocene: Grignon, France.

No. 1107. **Psecadium ellipticum,** Reuss.
Miocene.

No. 1108. **Pyrulina gutta,** D'Orb.
Pliocene: Castel-Arquato, Italy.

No. 1109. **Rhabdogonium acutangulum,** Reuss.
Lower Greensand.

No. 1110. **Rhabdogonium Martensi,** Reuss.
Lower Greensand.

No. 1111. **Rimulina glabra,** D'Orb.
Living: Adriatic.

No. 1112. **Robulina cultrata,** Montf.
Miocene: Baden, Austria. Living: Adriatic.

No. 1113. **Robulina virgata,** D'Orb.
Living: Adriatic.

No. 1114. **Sagrina pulchella,** D'Orb.
Living.

No. 1115. **Tinoporus baculatus,** Montf.
Living: Phillipines.

No. 1116. **Vaginulina Badenensis,** D'Orb.
Pliocene: Baden, Austria.

No. 1117. **Vaginulina cristellaroides,** Reuss.
Lower Greensand.

No. 1118. **Vaginulina elegans,** D'Orb.
Living: Adriatic.

No. 1119. **Vaginulina transversalis,** Reuss.
Gault.

No. 1120. **Vaginulina tricarinata,** D'Orb.
Living: Adriatic.

2. Sub-Order, Foraminifera imperforata.

Lituolida.

No. 1121. **Haplostiche foedissima,** Reuss.
Upper Greensand.

No. 1122. **Haplophragmium inflatum,** Reuss.
Upper Greensand.

No. 1123. **Haplophragmium irregulare,** Röm.
Chalk.

No. 1124. **Lituola irregularis,** D'Orb.
Chalk.

No. 1125. **Valvulina triangularis,** D'Orb.
Eocene: Valognes, France.

No. 1126. **Valvulina triangularis,** D'Orb.
Larger Variety. Eocene: Valognes, France.

Miliolida.

No. 1127. **Alveolina Boscii,** D'Orb.
Eocene: Grignon, France.

No. 1128. **Adelosina striata,** D'Orb.
Pliocene: Castel-Arguato, Italy. Living: Adriatic.

No. 1129. **Biloculina aculeata,** D'Orb.
Miocene: Bordeaux, France.

No. 1130. **Biloculina bulloides,** D'Orb.
Eocene: Grignon, France. Miocene: Bordeaux, France. Living: Adriatic.

No. 1131. **Biloculina depressa,** D'Orb.
Pliocene: Sienna, Italy. Living: Adriatic.

No. 1132. **Biloculina lunula,** D'Orb.
Miocene: Baden, Austria.

No. 1133. **Cornuspira involvens,** Reuss.
Miocene.

No. 1134. **Dendritina arbuscula,** D'Orb.
Miocene: Bordeaux, France.

No. 1135. **Fabularia discolithes,** Defr.
Eocene: Parnes and Valognes, France.

No. 1136. **Miliola compressa.**
Miocene: Vienna, Austria.

No. 1137. **Orbiculina numismalis,** Lam.
Living: West Indies.

No. 1138. **Orbitolites macropora,** Lam.
Chalk: Maestricht, Holland.

No. 1139. **Pavonina flabelliformis,** D'Orb.
(Variety.) Living: Madagascar.

No. 1140. **Peneroplis planulata,** Ficht.
(Variety.) Eocene: Paris, France. Living: Mediterranean and Red Sea.

No. 1141. **Peneroplis planulata,** Ficht.
(Variety.) Eocene: Paris, France. Living: Mediterranean and Red Sea.

No. 1142. **Peneroplis planulata,** Ficht.
(Variety.) Eocene: Paris, France. Living: Mediterranean and Red Sea.

No. 1143. **Peneroplis puichella,** D'Orb.
Living.

No. 1144. **Pavonina flabelliformis,** D'Orb.
Living: Madagascar.

No. 1145. **Quinqueloculina Ferussaci,** D'Orb.
Eocene: Parnes, France.

No. 1146. **Quinqueloculina lyra,** D'Orb.
Living: Adriatic.

No. 1147. **Quinqueloculina saxorum,** D'Orb.
Eocene: Paris, France.

No. 1148. **Quinqueloculina secans,** D'Orb.
Living: Mediterranean.

No. 1149. **Quinqueloculina ——.**
Living.

No. 1150. **Spirolina cylindrica,** Lam.
Eocene: Paris, France.

No. 1151. **Spiroloculina depressa,** D'Orb.
Pliocene: Sienna, Italy. Living: Mediterranean.

No. 1152. **Spirolina Austriaca,** D'Orb.
Miocene; Austria.

No. 1153. **Spiroloculina dilatata,** D'Orb.
Miocene: Baden, Austria.

No. 1154. **Spirulina punctata,** D'Orb.
Tertiary and living.

No. 1155. **Triloculina oblonga,** Montagu.
Eocene: Grignon, France. Miocene: Bordeaux, France. Pliocene: Castel-Arquato, Italy, Living: Mediterranean, Bay of Biscay, West Indies.

No. 1156. **Triloculina tricarinata,** D'Orb.
Living: Red Sea.

No. 1157. **Triloculina gibba,** D'Orb.
Miocene: Nussdorf, Austria. Pliocene: Sienna, Italy. Living: Adriatic and South Pacific.

No. 1158. **Triloculina trigonula,** D'Orb.
Eocene: Parnes, France.

No. 1159. **Uniloculina Indica,** D'Orb.
Living: India.

No. 1160. **Vertebralina mucronata,** D'Orb.
Living: Antilles.

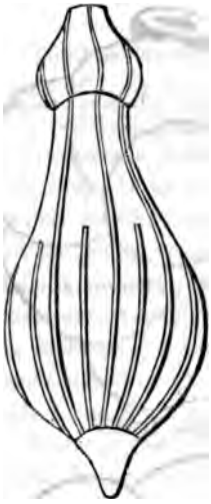
No. 1161. **Vertebralina nitida,** D'Orb.
Eocene: Grignon, France.

No. 1162. **Vertebralina striata,** D'Orb.
Living: Mediterranean, Red Sea and Southern Ocean.

No. 1163. **Vertebralina striata,** D'Orb.
(Broad Variety.) Living: Mediterranean, Red Sea and Southern Ocean.

This series of Foramenifera consists of 200 specimens which are each provided with a brass standard. Price, packed, $30.00.

The same with blocks for mounting. Price, packed, $35.00.



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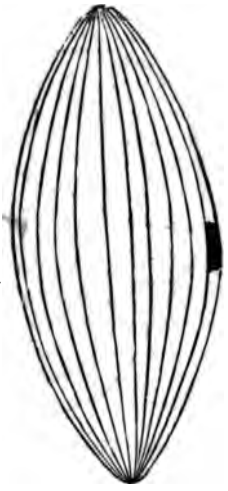

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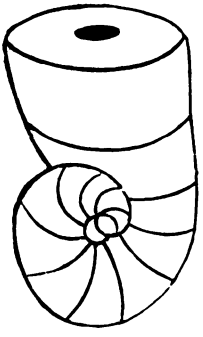

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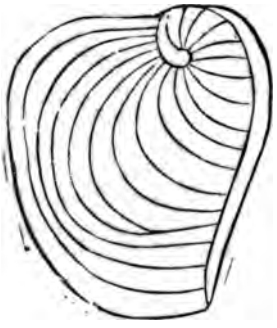

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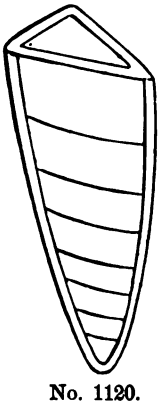
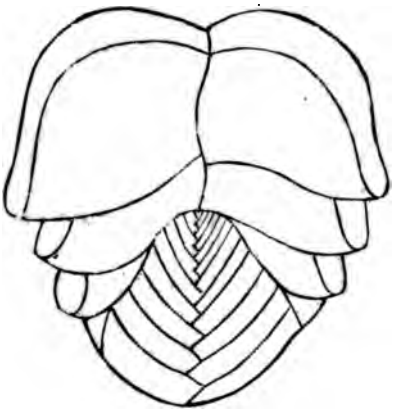


No. 1120.

No. 1145.

No. 1094. Nodosaria inflata. No. 1015. Proroporus complanatus. No. 968. Fusulina cylindrica. No. 1162. Vertebralina striata. No. 1046. Textularia nodosaria. No. 986. Ataxophragmium variabile. No. 1140. Peneroplis planulata. No. 1120. Vagulina tricarinata. No. 1145. Quinqueloculina Ferussaci.



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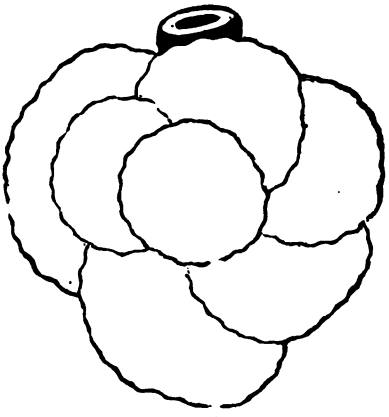

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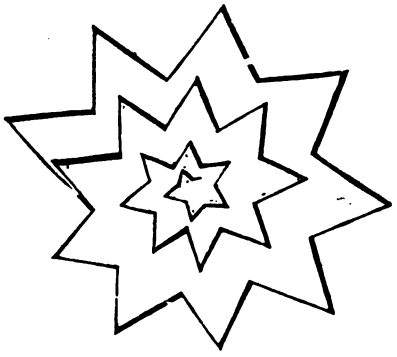

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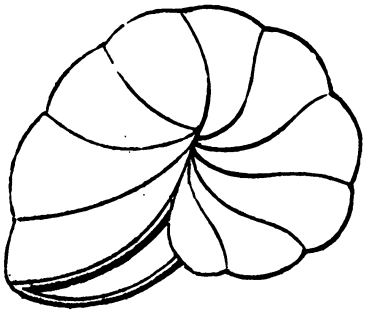

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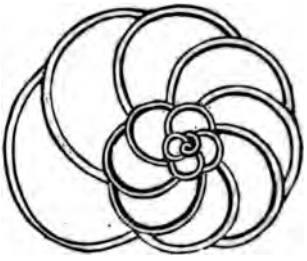


No. 1018.

No. 999. Cassidulina serrata.
No. 996. Calcarina calcar.
No. 998. Cassidulina lævigata.

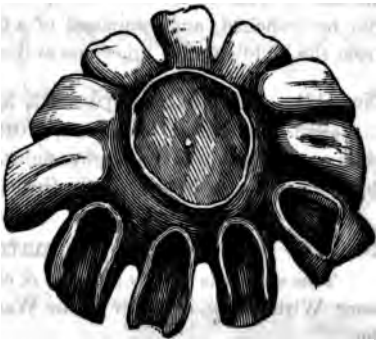
No. 1039. Siphonia reticulata.
No. 1049. Textularia spinulosa.
No. 1018. Rotalia Ariminensis.

CLASS III.—PORIFERA.

The Porifera or Sponges (called *Amorphozoa* by De Blainville, by reason of their diversity of forms), have a structure which is a union of transparent pulpy matter (sarcode) with tough horny fibre. This latter forms a branching net-work or skeleton throughout the entire organism. In most Sponges the skeleton is further strengthened by calcareous or siliceous spicula. Reproduction takes place by gemmules, and the young Sponge moves about for a time as a free organism; but after it attaches itself to some submarine rock, it shows no signs of movement or sensibility. The only evidences of life are its growth and the constant circulation of water—flowing in through the fine pores and discharged through the larger tubes. Excepting the fresh-water *Spongilla*, Sponges are natives of the sea.

Pictet enumerates 47 genera and over 400 species of fossil Sponges, which he groups in the three families of *Spongidæ*, *Clionidæ*, and *Petrospongidæ*. The first includes the living forms with horny skeleton, and the sole evidences of their existence in geological times are myriads of minute siliceous spicula which largely pervade the mass of some rocks. They are first found in the Silurian, and many layers in the Cretaceous strata are almost entirely composed of them. The *Clionidæ* are also Sponges of horny structure, which pierce the shells of Molluscs and the stems of Corals, and dwell parasitically in the cavities which they have bored. These cavities and the silicified casts of the perforations called "*Clionites*," quite riddle the valves of some shells which lived in the Cretaceous age. The *Petrospongidæ* had a reticulate stony frame-work without Spicula, pierced with pores and oscula as in the living Sponge. They have no representative at the present day, but abounded in the seas of all geological periods from the Silurian to the early Tertiary.

No. 1164. **Amorphospongia ——.**



This undescribed specimen of a large and remarkable fossil sponge, with eleven beautifully radiating and recurved hollow branches, is from the Lower Silurian, Franklin Co., Ky.

Size, 11 x 11. Price, $3.25.

No. 1165. **Cœloptychium agaricoides,** Goldf.

Two specimens. These mushroom-like Sponges have the upper surface marked by pores in transverse lines, and the lower one rayed. From the Chalk, Haldem, Westphalia, and now in the Ward Museum of the University of Rochester. Price, $1.25

No. 1166. **Placoscyphia meandroides,** Leymerie.

This genus of irregular Sponges is characterized by thin plates in complicated windings, and pores disposed in lines through the little irregular furrows. From the Upper Greensand, Kent, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.70.

No. 1167 **Placoscyphia meandroides,** Leym.

From the same locality and Cabinet. Price, $0.60.

No. 1168. **Polypothecia dichotoma,** Benett.

This genus is allied to *Scyphia*. The species presents considerable diversity of shape This beautiful specimen shows several branches springing from one root. Upon breaking these stems transversely, sections of parallel longitudinal tubes are exhibited as in *Siphonia*. From the Upper Greensand, Warminster, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 7 x 4. Price, $1.00.

No. 1169. **Retispongia (Scyphia) Hœninghausii,** Goldf.

This cup-shaped Sponge is provided on the outside with little branches which form irregular meshes. It is related to *Cœloptychium*. From the Chalk of Northern Germany, and now in the Ward Museum of the University of Rochester. Price, $0.30.

No. 1170. **Scyphia clathrata,** Goldf,

(Syn. *Cribrospongia clathrata,* D'Orb.) The Sponges of this genus are of a tubular or cylindrical form, and terminate in a rounded pit; they are either simple or branched, and composed of a firm reticulated tissue. This specimen is from the Middle Oolite limestone at Bayreuth, Bavaria. Price, $0.60.

No. 1171. **Scyphia empleura,** Münst.

(Syn. *Goniospongia empleura,* D'Orb.) In this species, the filaments of the tissue cross one another at right angles. From the Middle Oolite, Heiburg, Wirtemberg, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 1172. **Scyphia polyommata** (?) Goldf.

This species is closely allied to *S. clathrata.* From the Middle Oolite, Streitberg, Wirtemberg, and now in the Ward Museum of the University of Rochester. Size, 9 x 8. Price, $1.50.

No. 1173. **Scyphia propinqua,** Münst.

(Syn. *Eudea propinqua,* D'Orb.) From the Middle Oolite, Œhringen, Wirtemberg. Price, $0.40.

No. 1174. **Siphonia (Hallirhoa) costata,** Lamouroux.

(Syn. *Polypothecia septemloba,* Benett.) Two specimens. The fossil Porifera, belonging to this genus, have a comparatively symmetrical form. The body is bulbous and supported by a slender stem, which is composed of very fine parallel longitudinal tubes, terminating on the surface of the central cavity. The base of the stem was fixed by root-like processes. From the Upper Greensand, Warminster, England, and now in the private Geological Cabinet of Mr. Ward, of Rochester. Size, $1.25.

No. 1175. **Siphonia ——.**

Two specimens. From the Cretaceous (?), Germany, and now in the Ward Museum of the University of Rochester. Price, $0.75

No. 1176. **Siphonia radiata?**

From the Jurassic, Wirtemberg, and now in the Ward Museum of the University of Rochester. Price, $0.60.

No. 1177. **Siphonia pyriformis,** Goldf.

Two specimens. These pear shaped Sponges are from the Upper Greensand, Blackdown, England,(a locality which has furnished many very interesting and peculiar forms of Ponifera), and are now in the Ward Museum, of the University of Rochester. Price, $0.60.

No. 1178. **Spongia ramosa,** Mant.

This branched Sponge has cylindrical stems and branches, the terminations of the latter being rounded and full of pores. This specimen is completely incrusted with flint, presenting a bizarre appearance. From the Chalk of Dover; England, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 1179. **Spongia ——.**

Two specimens; silicified. From the Upper Chalk, Bridlington, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 1180. **Spongia ——.**

Silicified. From the same locality and Cabinet as the preceding. Size, 6 x 2. Price, $0.60.

No. 1181. **Spongia ——.**
Silicified. From the same locality and Cabinet as the preceding.
Size, 7 x 1. Price, $0.60.

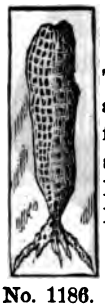
No. 1182. **Spongia ——.**

Silicified. From the Upper Chalk, Bridlington, England, and now in the Ward Museum, University of Rochester.
Size, 6 x 2. Price, $0.60.

No. 1183. **Spongites vagans ?** Quenstedt.
From the Middle Oolite, Wirtemberg, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.40.

No. 1184. **Tragos ——.**
The Sponges of this genus are turbinated, and have rather large oscula, disposed irregularly on the inner surface. From the Middle Oolite, Wirtemberg, and now in the private Geological Cabinet of Mr. Ward, Rochester.
Price, $0.50.

No. 1185. **Ventriculites ——.**



The *Ventriculites* are the largest group of Cretaceous Sponges. They are shaped like a mushroom or funnel, tapering to a point below, and attached by rootlets. The astonishing complication of their surface is shown by the fact, pointed out by Toulmin Smith, that in one specimen, only three inches high, nine millions of fibrils were found! From the Upper Chalk of Bridlington, England, and now in the Ward Museum of the University of Rochester. Size, 10 x 3. Price, $1.00.

No. 1186. **Ventriculites alcyonoides,** Mant.
From the Chalk of Kent, England, and in the same Museum as the preceding. Price, $0.60.

No. 1187. **Ventriculites radiatus,** Mant.
Two specimens. A broadly expanded, discoid Sponge with a small round stem. From the Upper Chalk, Bridlington, England, and now in the Ward Museum, University of Rochester. Price, $1.50.

No. 1188. **Ventriculites radiatus,** Mant.
From the same locality and Museum as the preceding. Price, $0.40.

No. 1189. **Ventriculites ——.**
From the same locality and Museum as the preceding. Price, $0.50.

No. 1190. **Ventriculites ——.**

A singular flower-like specimen from the Upper Chalk, Bridlington, England, and now in the private Geological Cabinet of Mr. Ward, Rochester.

Price, $1.50.

No, 1191. **Ventriculites ——.**

This specimen of a goblet-shaped fossil Sponge of most extraordinary size is from the Chalk beds of Moira in the North of Ireland. It is the variety called "Paramoudra" in the vernacular of the natives—a term which Dr. Buckland introduced into Geological Science. The original, which is of solid flint, is in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 24 x 20. Price, $6.50.

No. 1192. **Ventriculites ——.**

Coated by flint. From the Upper Chalk, Wiltshire, England, and now in the Ward Museum, University of Rochester. Size, 8 x 6. Price, $0.75.

No. 1193. **Ventriculites ——.**

Coated by flint. From the Upper Chalk, Wiltshire, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Price, $0.60.

No. 1194. **Ventriculites ——.**

Coated by flint. From the same locality aud Cabinet as the preceding.

Price, $0.60.

No. 1195. **Ventriculites ——.**

From the Upper Chalk, Bridlington, England, and now in the Ward Museum, University of Rochester. Price, $0.40.

No. 1196. **Ventriculites ——.**

From the Upper Greensand, Warminster, England, and now in the private Geological Cabinet of Mr. Ward, Rochester. Size, 11 x 5. Price, $1.00.

No. 1197. **Ventriculites ——.**

From the same locality and Cabinet as the preceding.

Size, 6 x 5. Price, $0.70.

This entire Suite of Fossil Sponges, consisting of 40 specimens, will be furnished, packed, for $30.00.

ADDENDA.

No. 1198. **Halitherium Schinzi,** Kaup.

SKULL AND LOWER JAW. The close relationship between this herbivorous cetacean and the living Dugong and Manatee is very clearly shown by all the bones of the skeleton, but especially so in the bones of the head. We have here the broad flat frontal, the short, stout zygoma, and the suddenly down-curved premaxillaries, of the modern Siren representative. This specimen, from the Miocene beds of the Rhine Valley, is part of an entire skeleton in the private Geological Cabinet of Mr. Ward, Rochester.

Size, 10 x 12. Price, mounted, $6.00.

No. 1199. **Bos (Bison) priscus,** Boja.

Cranium with Horn cores. This specimen is from the Alluvium of the Po in the Valley of Pavia, and is now in the Museum of Parma. The span of the horns is 43 inches. Size, 43 x 13. Price, $8.50.

No. 1200. **Bos primigenius,** Boja.

Cranium with Horn-cores. From the same locality and Museum as the preceding. The span of the horns is 39 inches. Size, 39 x 13. Price, $7.00

No. 1201. **Coprolite,** Buckl.

This specimen is undoubtedly the fossil excrement of a Fish, according to Mantell, of the Ganoid *Macropoma.* It has a conical form and a convoluted appearance, arising from the fact that the intestinal canal was spirally twisted. The analysis of Prout shows these fæcal remains to be composed chiefly of phosphate of lime. This coprolite was found in the Lower Chalk, Kent, England. Price, $0.25.

No. 1202. **Hoploparia (Astacus) longimana,** Sow.

This long-tailed Decapod resembles the Lobster. The cheeks are prolonged in the shape of semi-cylindrical horns; and the fore-arms are very long and unequal. From the Greensand, Lyme-Regis, England, and now in the private Geological Cabinet of Mr. Ward) Rochester. Size, 10 x 3. Price, $1.25.

No. 1203. **Ammonites tornatus,** Brown.

This Ammonite belongs to the group "*Globosi,*" characterized by being very closely coiled, umbilicus quite small or wanting, surface smooth or feebly striated and devoid of ribs and tubercles. It is from the Trias at Hallstadt, Austria, and is now in the Ward Museum, University of Rochester. Price, $0.60.

ZOOLOGICAL SUMMARY.

Vertebrata,	139 genera ;	223 species.
Articulata,	56 "	89 "
Mollusca,	100 "	272 "
Radiata,	95 "	173 "
Protozoa,	100 "	207 "
Total,	490 genera.	964 species.

GEOLOGICAL SUMMARY.

Post-Tertiary,	140 specimens.
Tertiary,	262 "
Cretaceous,	186 "
Jurassic,	270 "
Trias,	30 "
Permian,	4 "
Carboniferous,	90 "
Devonian,	78 "
Silurian,	140 "
Total,	1200 specimens.

MISCELLANEOUS.

No. 1204. **Cycadoidea megalophylla,** Buckl.

(Syn. *Mantellia nidiformis.* Brongn.) This short, spheroidal trunk probably belonged to a Cycad,—a tropical plant related to the Conifers in structure and fructification, but totally different in habit. It supported a tuft of large, pinnated, palm-like leaves; and the surface is covered with rhomboidal scars formed by the attachment of the leaf-stalks. Its shape has caused it to be named "*Crow's Nest*" by the quarrymen. Neither leaves nor fruit have been found. From the Purbeck beds (Wealden), Isle of Portland, England, and now in the Ward Museum, University of Rochester. Size, 12 x 12. Price, $2.50.

No. 1205. **Cycadoides megalophylla,** Buckl.

A more compressed form of the preceding. The original is in the private Geological Cabinet of Mr. Ward, Rochester. Size, 15 x 14. Price, $2.25.

No. 1206 **Dammarites** ——, Sternb.

A Conifer from the Inferior Oolite, Burton, Somerset, England.

Size, 6 x 6. Price, $0.75.

No. 1207. **Nipadites Burtini,** Brong.

This fossil palm-nut is so called from its resemblance to the fruit of the existing *Nipa* of Bengal and the East Indies. The *Nipa* is allied to the cocoa-nut tribe on the one side, and on the other to the screw-pine. It is a low-growing plant, luxuriating in marshy tracts at the mouths of great rivers. From the Eocene clay, Schærbeck, Belgium, and now in the Ward Museum, University of Rochester. Size, 8 x 7. Price, $1.25.

No. 1208. **Model of a Whale (Balæna mysticatus,** Linn.)

This was modeled by an artist at the Garden of Plants, Paris, after materials furnished by that Museum. It is useful for illustration in the class, as it shows the proportions of this huge mammal, the position of the "whale-bone," eyes, blow-holes, etc. Size, 25 x 11. Price, $5.00.

No. 1209. **Rain Prints.**

Pittings or depressions, made in ancient times by drops of rain on a surface of clay or half-dried mud, have been found on all the aqueous deposits as far back as the very earliest. They furnish us with evidence of the intensity and continuance of the primeval shower, and even of the quarter whence the wind blew that drove them against the muddy flats of long since obliterated shores and estuaries. This slab is from the Lias (?) at Turner's Falls, Mass.

Size, 3 ft. 2 in. x 22 in. Price, $4.00.

No. 1210. **Sun Cracks and Mud Veins.**

This slab is from the Lias (?) sandstone of the Connecticut Valley.

Size, 26 x 17. Price, $2.50.

No. 1211. **Concretionary Cavities.**

This slab is covered with rounded polygonal cavities, arranged in somewhat regular rows. They were regarded by Hitchcock as the nests of ancient tadpoles. (*Batrachoides nidificans*, Hk.) It is more probable that they are the result of some crystallization of the ancient mud at the time of, or soon after, its deposition. From the Lias (?) sandstone, South Hadley, Mass.

Size, 2 ft. 6 in. x 1 ft. 9 in. Price, $2.50.

No. 1212. **Gold Nugget.**

This is the celebrated "Welcome Nugget," the largest Mass of Gold ever discovered. It was found at Ballarat, Australia, June 11, 1858, brought to England in June, 1859, and melted Sept. 22, 1859. The weight of the Nugget was 2166 ounces, of which 2019¾ ounces were fine gold, and the remainder stony matter. Value, $41,882.70. (This, like the following is carefully gilded, and an exact fac-simile.) Size, 19 x 11. Price, $15.00.

No. 1213. **Gold Nugget.**

A large but thin, sheet-like specimen, weighing 145 pounds (Troy), found in 1857, in Melbourne, Australia. Size, 24 x 10. Price, $12.00.

No. 1214. **Gold Nugget.**

A mass, weighing nearly 100 pounds Troy, discovered in 1842 in the Valley of Taschku Targanka in the Urals, Siberia, and now in the Museum of the Royal School of Mines, St. Petersburg, Russia. Size, 14 x 12. Price, $10.00.

No. 1215. **Gold Nugget.**

An irregular form from Oregon Canon, El Dorado Co., California, and, like the preceding, evidently filling a geodic cavity in quartz. Price, $2.25.

No. 1216. **Platinum Nugget.**

This is the largest known native mass of Platinum. It was discovered near Tagilsk, in the Ural, Siberia, in 1827, and weighs 21 pounds Troy. The original is now in Count Demidoff's Cabinet, Russia. Price, $2.25.

Meteorites.

No. 1217. Fell Feb. 28, 1857, at Parnallee, Madras, India.

Size, 19 x 14. Price, $3.50.

No. 1218. Fell May 12, 1861, at Qutahar Bazaar, Butsura, India.

Size, 14 x 8. Price,2.50.

No. 1219. Fell Dec. 13, 1795, at Wold Cottage, Yorkshire, England.
Size, 11 x 10. Price, $2.25.

No. 1220. Fell May 12, 1861, at Piprassi, Butsura, India.
Size, 12 x 5. Price, $1.50.

No. 1221. Fell Feb. 18, 1815, at Durala, Putteala, India.
Size, 11 x 4. Price, $2.00.

No. 1222. Found in 1861, at Breitenbach, Bohemia. Size, 10 x 6. Price, $1.75.

No. 1223. Fell July 14, 1847, at Brannau, Bohemia. Size, 10 x 9. Price, $3.00.

No. 1224. Fell Jan. 23. 1852, at Nellore, Madras. Size, 10 x 9. Price, $2.00.

No. 1225. Fell May 12, 1861, at Chirega, Butsura, India.
Size, 9 x 5. Price, $1.50.

No. 1226. Fell March 6, 1863, at Seegowlee, Bengal. Size, 9 x 6. Price, $1.50.

No. 1227. Found in 1854, in Werchneudinsk, Eastern Siberia.
Size, 12 x 7. Price, $2.00.

No. 1228. Fell April 18, 1838, at Akburpûr. Saharanpûr, India. Price, $1.00.

No. 1229. Fell March 6, 1853, at Seegowlee, Bengal. (Part of No. 1226.)
Price, $0.75.

No. 1230. Fell March 6, 1853, at Seegowlee, Bengal. (Part of No. 1226.)
Price, $1.00.

No. 1231. Fell Nov. 30, 1822, at Bithoor, Cawnpore, India. Price, $0.50.

No. 1232. Fell March 28, 1860, at Kheragur, India. Price, $0.50.

No. 1233. Fell May 12, 1861, at Bullooah, Butsura, India. Price, $0.50.

No. 1234. Fell Dec. 2, 1852, at Butsee, Zyzabad, India. Price, $1.25.

No. 1235. Fell March 6, 1853, at Seegowlee, Bengal. Price, $0.50.

No. 1236. Fell May 1, 1860, in Guernsey Co., Ohio. Original in the Ward Museum in the University of Rochester. Price, $0.50.

Price of the set of 20 specimens, packed, $30.00.

No. 1237. Rosetta Stone.

This famous stone—the key to the Hieroglyphics of Egypt—was discovered by the French in 1799 at Rosetta (Raschid of the Arabs), a sea-port town of Lower Egypt. The inscription is in three languages—Greek, Demotic and Hieroglyphic; and was made by order of Ptolemy V. surnamed Epiphanes, 193 B. C. This cast is a faithful copy of the original now in the British Museum.

Size, 2 ft. 7 in. x 2 ft. 5 in. Price, $12.00.

No. 1238. Relief Map of Central France.

The district of Auvergne, represented by this Map, lies on the tributaries of the Loire, about 212 miles south of Paris, and is of peculiar interest. We are presented, says Lyell, "with the evidence of a series of events of astonishing magnitude and grandeur, by which the original form and features of the country have been greatly changed; yet never so far obliterated but that they may still, in part at least, be restored in imagination. Great lakes have disappeared—lofty mountains have been formed, by the reiterated emission of lava, preceded and followed by showers of sand and scoriæ;—deep valleys have been subsequently furrowed out through masses of lacustrine and volcanic origin;—at a still later

date, new cones have been thrown up in these valleys,—new lakes have been formed by the damming up of rivers;—and more than one creation of quadrupeds, birds and plants, Eocene, Miocene and Pliocene, have followed in succession; yet the region has preserved from first to last its geographical identity; and we can still recall to our thoughts its external condition and physical structure before these wonderful vicissitudes began, or while a part only of the whole had been completed." The whole region consists in large measure of granite and crystalline rocks, and is full of vestiges of most intense volcanic action—presenting multitudes of truncated cones of scoriæ and ashes, apparently quite fresh, trachytic domes, basaltic colonnades and plateaux of immense extent. Some of these volcanoes (as Puy de Dôme and Puy de Sarcouy), are characteristic specimens of that class of mountains which, though volcanic, appear never to have been, properly speaking, in eruption. The material (trachyte, domite,.etc.) issued from the earth, apparently, in so imperfect a state of fluidity as not to run, but to form rounded masses. According to Lyell, these extinct volcanoes began their eruptions so called, in the Upper Eocene period, but were most active during the Miocene and Pliocene eras; the latest eruptions occurred at the close of the Newer Pliocene, if not in the Post Pliocene period.

This region, displaying as it does so remarkably the grand succession of events in Central France since the last retreat of the sea, and illustrated by the masterly researches of Scrope, Lyell and Murchison, is perhaps the finest field in the world for the study of extinct volcanic action. This large Relief Map is a copy of the one made by G. Poulett Scrope, F. R. S. and deposited in the Rooms of the British Geological Survey, London.

Size, 5 ft. 6 in. x 4 ft. 9 in. Price, $75.00.
In glass-case, $100.00.

No. 1239. Relief Map of Vesuvius.

The Map shows a portion of the Bay of Naples, and the slope of the volcano on all sides from its crater to the plain. The steep, semi-circular escarpment of Monte Somma, and the modern cone of Vesuvius which it faces, rise in bold relief; and the various lava currents which have been ejected—from that which overwhelmed Herculaneum to the eruption of 1820, are represented with their dates. Size, 2 ft. x 2 ft. 6 in. Price, $10.00.

No. 1240. Relief Map of Etna.

This celebrated volcano—the loftiest in Europe—rises near the sea to the height of nearly 11.000 feet. The most striking and original feature in its physiognomy is the multitude of minor cones distributed over its flanks. They number about eighty, and throw out sulphurous vapors. The modern lavas overlie the ancient basaltic masses and sedimentary deposits of Mesozoic and Tertiary ages. Near the summit of Etna is the Val del Bove—a famous gorge of magnificent dimensions, a vast amphitheatre four or five miles in diameter, surrounded by nearly vertical precipices from 1,000 to 3,000 feet high. This very accurate map was modeled after the one constructed on the spot by Elie de Beaumont, the noted French Geologist.

Size. 17 x 16. Price, $6.00.

No. 1241. Relief Map of Teneriffe.

This volcanic peak stands, says Von Buch, like a tower encircled by its fosse and bastion,—the bastion consisting of precipitous cliffs which, according to the theory of that geologist, were heaved up into their present position by a force

exerted from below. We may consider Teneriffe, says Lyell, as having been from a remote period the principal and habitual vent of the volcanic Archipelago of the Canaries. This Map shows the whole island, the *"Canadas"* and their relation to the modern lavas, the crater of Chahorra, and the snow-clad Peak of Teyde.

Size, 2 ft. 3 in. x 2 ft. Price, $10.00.

No. 1242. Relief Map of Palma.

Palma is a type of Von Buch's "crater of elevation." The Map represents the entire island, showing the two mountain masses of which it consists, the deep cavity—*"La Caldera"*—in the centre, and the great ravine or "barranco" leading to the sea.

Size, 2 ft. 4 in. x 1 ft. 8 in. Price, $10.00.

No. 1243. Relief Map of Bourbon.

This volcanic island, called *Reunion* by the French, is covered with mountains which are separated by narrow valleys. The Piton de Neiges is an extinct volcano, while Peton de la Fournaise is known to have been active, like Popocatapetl, for periods of 60 or even 150 years. This map shows the relation of ancient trachyte and basalt to volcanic rocks and craters of modern date, and to the coral reefs which fringe the island. Size, 10 x 9. Price, $4.00.

No. 1244. Relief Map of Mont Blanc.

This celebrated mountain is the culminating point of the Alps and of all Europe. This relief Map, colored geologically, exhibits the mountain-monarch surrounded by its subordinate peaks, the various *cols* or passes, the magnificent glaciers—over 30 in nmmber, with their lateral and terminal moraines and the streams flowing from them. The higher granitic points are seen flanked by metamorphic rocks, and on all sides are signs of an intense development of plutonic action. Here, says Lyell, we find the most stupendous monuments of mechanical violence, by which strata thousands of feet thick have been bent, folded and overturned. Oolitic and Cretaceous formations have been upheaved to the height of 12,000 feet; some Eocene strata to elevations of 10,000 feet; and even deposits of the Miocene era rival in height the loftiest mountains of Great Britain. The Pliocene beds are undisturbed. An explanatory list of about 200 names accompanies the Map, serving as a guide to the topography and geology of this interesting region. Size, 2 ft. 3 in. x 1 ft. 11 in, Price, $15.00.

Busts of Distinguished Naturalists.

No. 1245. LINNÆUS, (Charles Linnæus.) Born, 1707. Died, 1778.
Size, 23 x 12. Price, white, $5.00; bronzed, $6.00.

No. 1246. BUFFON, (George Louis Leclerc.) Born, 1707. Died, 1788.
Size, 23 x 12. Price, white, $5.00; bronzed, $6.00.

No. 1247. CUVIER, (George Cuvier.) Born, 1769. Died, 1832.
Size, 23 x 12. Price, white, $5.00; bronzed, $6.00.

No. 1248. GEOFFROY, (Etienne Geoffroy Saint-Hilaire.) Born, 1772. Died, 1844.
Size, 23 x 12. Price, white, $5.00; bronzed, 6.00

ERRATA.

Minor errors which explain themselves are not mentioned. Generic and Specific names which are misspelled in the text, will be found correct in the Index.

In the earlier pages, the Lithographic limestone of Bavaria was erroneously assigned to the Upper instead of Middle Oolite.

Page 26, under No. 75: for "complement," read *part.*
" 35, " " 131: insert "Price, $8.00."
" 40, " " 149: for "$4.00." read $9.00.
" 51, " " 192: for "giganteum," read *Sillimanium.*
" 58, " " 213: for "skull," read *head.*
" 61, " " 226: for "$1.90," read $1.00.
" 70, " " 264: for "Lower Jaw," read *Upper Jaw.*
" 74, " " 285: for "ventral surface," read *dorsal surface.*
" 92, line 22: for "(Pollipeds)" read (*Pollicipeds*).
" 92, " 24: for "Sub-Class II," read *Sub-Class I.*
" 95, under No. 363: insert Size, "8 x 8. Price, $1.25."
" 96, " " 372: for "Body, segments," read *Body-segments.*
" 102, " " 406: for "the preceding," read *No.* 408.
" 105, " " 431: for "Lower Silurian," read *Upper Silurian.*
" 106, " " 436: insert "Two specimens."
" 122, " " 499: *dele* "in the Ward Museum," &c.
" 122, " " 500: for "same locality," read *Lias of Whitby, England.*
" 138, " " 609: for "Gratioloup," read *Grateloup.*
" 140, " " 632: the cut with this No. belongs to No. 631.
" 143, " " 656: for "value," read *valve.*

APPENDIX

A. page 14, The skeleton of the Megatherium is furnished to purchasers carefully boxed, and with Nos. on the ribs and vertebra which prevent confusion. Drawings of the Irons for mounting will be sent *gratis*, or the Irons themselves for the price of $45. Information will also be given to those who wish to mount the skeleton themselves. Mr. Ward will send two experienced workmen to mount it for those who may desire. In these cases he will furnish the Irons and the Tree (see cut), and do the work—*leaving the specimen complete and painted*, —for the sum of $350, and the railroad fare of the men.* To render the great skeleton still more attractive, as well as to furnish the necessary protection against injury from visitors, an iron railing has been prepared. It has ten square, ornamental, bronzed posts with two parallel, horizontal bars between them, forming an enclosure. On the top of each of these posts is a bronzed statue of an Edentate animal—either living or fossil. These are, in the order in which they should stand,—the Pichiciego, Armadillo, Aard-vark, Sloth, Mylodon, Little Ant-eater, Great Ant-eater, Phatagin—or long-tailed Manis,—Glyptodon, and Megalonyx. The price of this railing complete, with bronzed posts, each strongly boxed, is $175.00.

The Megatherium, when well mounted and carefully colored, cannot be distinguished (save on critical examination) from an actual skeleton,† and is the most graphic and imposing of the entire series of casts noticed in the Catalogue. It forms a very appropriate object to stand in the middle of a large Geological Hall.

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* *The transportation of all the material, and the cost of the pedestal on which the skeleton stands, would be met by the purchaser.*

† "*The views of the entire skeleton (of the Megatherium) have been taken from the articulated casts, which are so beautifully exact, as, for all the essential purposes of science, to be of the same value and utility as the bones themselves would be, if so articulated together.*" OWEN, *Memoir on Megatherium, page* 12.

Testimonials.

From the late PRESIDENT HITCHCOCK, of Amherst College.

Amherst, Nov. 21st, 1868.

Prof. H. A. Ward,

My dear Sir,

I have just sent you four large boxes containing moulds of twelve of the more prominent slabs of tracks in our Ichnological Museum. The moulder whom you sent on, copied these with *much* skill and truth; and the casts which you take from them will certainly be very close representations of the originals, and give their possessors an exact view of these wonders from the rocks of the Connecticut.

I am delighted to see the excellent work which you are accomplishing in the matter of these plaster copies of the larger and rarer fossils. Is is no small thing thus to put into our hands, as it were, the wealth of the old European Museums, and to re-create for us, in actual, tangible forms, the huge and strange animals which walked our globe in the age of Reptiles and of Mammals, or swam and crawled through the muddy wastes of the Palæozoic seas. Hardly anything could be more fortunate to American students of Geology than the appearance of these casts, of which you say that your Catalogue will enumerate over 1000. They will be invaluable adjuncts to the scientific department in every Academy, College or University in our country; and it would be folly for any one pretending to teach Geology not to make use of them. I believe that our men of science in America will fully appreciate, and be glad to profit by, your undertaking, and that you will have the satisfaction of seeing that your labour has not been in vain.

Our College has obtained from you as many of these casts as our funds would permit, and we have much admired the care which you have expended in making their form and color exact copies of the original specimens. For the sake of Geological science, as well as for yourself, I wish you ample success in your enterprise, and expect that you will have it

Truly yours,

EDWARD HITCHCOCK.

From the American Journal of Science and Arts, for July, 1866.

Prof. Henry A. Ward's Collection of Casts of Fossils, at Rochester, N. Y.

Prof. Ward, in the course of his travels for the formation of his large Cabinet at Rochester, has had occasion to make casts of numerous fossils, large and small, from the skeletons of Elephants, Mastodons, and the Guadaloupe Man to shells of Rhizopods; and he is consequently enabled to furnish copies

of them to other Cabinets. He is now issuing an illustrated catalogue of 150 pages or more, which gives some idea of the extent of his collections. His casts have already reached a number of scientific cabinets in the country, among them those of Yale, Amherst, Cambridge, Vassar College, Albany, etc.; and whereever they have gone they are admired for their excellance and perfection of finish. We would recommend to Colleges, Academies, and other institutions where science is taught in the land, to supply themselves, as far as they are able, with these casts. They enable the instructor to exhibit to students specimens of the rare fossil skeletons and other species from the rocks, many of which are seldom or never found in American collections. By means of them, series representing the principal types of different Families (as that of Trilobites, or of Ammonites, etc.) may be made complete or nearly so. The casts are light and strong, and thus are well-fitted for class purposes. They have been copied from the best specimens to be found in any collections, and are colored to correspond with the originals. They give, at comparatively small expense, wonderful effectiveness to a cabinet as a means of instruction. A gift of a collection of Mr. Ward's casts from any patron of learning to an academy or college would render great service to the instructor, the pupils, and the institution.

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depressa (*depressed*).
dilatata (*spread out*).

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Spirulina (*doughnut*), ... 198
punctata (*dotted*).
Spongia (*sponge*), ... 203
ramosa (*branching*),
Spongites (*sponge*), ... 204
vagans (*wandering*).
Squala (*shark*), ... 88
Squatina (*monk-fish*), ... 87
acanthoderma (*spine-skinned*).
Staurocephalus (*cross-headed*), ... 107
Murchisoni (*proper name*).
Stirechinus, ... 161
Scillæ (*of Scilla, Naples*).
Stomechinus (*mouth-urchin*), ... 161
Robinaldinus (*proper name*).
Streptorhynchus (*twisted beak*), ... 152
hipparionyx (*little horse-hoof*).
umbraculum (*with walks*).
Stringocephalus (*owl-head*), ... 150
Burtini (*proper name*).
Strophodonta (*twisted tooth*) 152
magnifica (*magnificent*).
vascularis (*vascular*).
Strophostylus (*twisted style*), ... 181
cyclostomus (*circle-mouthed*).
Sus (*hog*), ... 24
Erymanthius (*of Erymanthus, Greece*).
giganteus (*gigantic*).
scrofa (*sow-like*).
Tapirus (*tapir*), ... 29
Arvernensis (*of Auvergne, France*).
Teleosaurus (*end-lizard*), ... 67
Cadomensis (*of Caen, France*).
Chapmanni (*proper name*).
longipes (*long-footed*).
Mandelslohi (*proper name*).
minimus (*least*).
Tentaculites (*tentacle-stone*), ... 111
elongatus (*lengthened*).
Terebratula (*little borer*), ... 149
conglobata (*spherical*).
cor (*heart-like*).
cornuta (*horned*).
curvifrons (*with curved front*).
Darwini (*proper name*).
Edwardsii (*proper name*).
Eugenii (*proper name*).
grandis (*great*).
Guerangeri (*proper name*).
indentata (*indented*).
intermedia (*intermediate*).
Lycetti (*proper name*).
Mariæ (*proper name*).
Moorei (*proper name*).
numismalis (*coin-like*).
perovalis (*very oval*).
plicata (*folded*).
quadrifida (*four-cleft*).
resupinata (*upside down*).
Sarthacensis (*of Sartha, France*).
subnumismalis (*somewhat coin-like*).

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subovoides (*somewhat oval*).
Teredina (*little borer*), ... 147
personata (*mask-like*).
Testudo (*tortoise*), ... 74
hemisphærica (*hemispherical*).
Nebrascensis (*of Nebraska*).
Tetraprotodon (*four front-teeth*), ... 26
palæindicus (*of ancient India*).
Teuthopsis (*cuttle-fish-shape*), ... 116
oblonga (*oblong*).
Textularia (*little weaver*), ... 191
Capreolus (*of Isle of Capri*).
conulus (*little cone*).
digitata (*fingered*).
gibbosa (*humped*).
nodosaria (*knobby*).
pupoides (*doll-like*).
pygmæa (*pygmy*).
spinulosa (*covered with little spines*).
Thaumas (*wonder*), ... 88
alifer (*winged*).
speciosus (*beautiful*).
Thracia (*Thrace, Greece*), ... 146
Thylacoleo (*pouched lion*), ... 47
carnifex (*deadly*).
Tinoporus (*pore-plant*), ... 195
baculatus (*staff-like*).
Toxaster (*bow-star*), ... 168
amplus (*full*).
complanatus (*smoothed*).
Toxoceras (*bow-horn*), ... 131
moutonianum (*like ram's horn*).
obliquatum (*oblique*).
Toxodon (*bow-tooth*), ... 43
angustidens (*narrow-toothed*).
Tragos (*sponge*), ... 204
Trematocrinus (*hole-lily*), ... 181
tuberculosus (*covered with tubercles*).
typus (*typical*).
Trematospira (*hole-coil*), ... 153
multistriata (*with many striæ*).
Tridentipes (*trident-foot*), ... 52
uncus (*hooked*).
Trigonia (*three corners*), ... 146
caudata (*tailed*).
clavellata (*with little knobs*).
costata (*ribbed*).
crenulata (*crinkled*).
Triloculina (*three cells*), ... 198
gibba (*humped*).
oblonga (*oblong*).

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tricarinata (*three-keeled*).
trigonula (*triangular*).
Trinucleus (*three kernels*), ... 118
concentricus (*concentric*).
Triplesia (*triple ?*) 151
exstans (*standing out*).
Tritaxia (*triple order*), ... 191
tricarinata (*three-keeled*).
Trogontherium (*gnawing beast*), ... 10
Cuvieri (*proper name*).
Trocholites (*wheel-stone*), ... 133
ammonius (*horn-like*).
Truncatulina (*little bit*), ... 191
refulgens (*glistening*).
tuberculata (*having tubercles*).
Turrilites (*tower-stone*), ... 131
costatus (*ribbed*).
polyplocus (*many-folded*).
Undina (*mythological name*), ... 83
striolaris (*striated*).
Uniloculina (*one cell*), ... 198
Indica (*of the Indies*).
Ursus (*bear*), ... 8
spelæus (*cave*).
Uvigerina (*cluster-bearer*), ... 191
pygmæa (*pygmy*).
Vaginulina (*husk*), ... 195
Badenensis (*of Baden, Germany*).
cristellaroides (*crest-like*).
elegans (*elegant*).
transversalis (*transverse*).
tricarinata (*three-keeled*).
Valvulina (*pod*), ... 196
triangularis (*triangular*).
Ventriculites (*little belly*), ... 204
alcyonoides (*king-fisher-like*).
radiatus (*rayed*).
Vertebralina (*little vertebra*), ... 198
mucronata (*dagger-like*).
nitida (*neat*).
striata (*striated*).
Vulvulina (*little womb*), ... 192
gramen (*grass*).
Woodocrinus (*Wood's lily*), ... 181
decadactylus (*ten-fingered*).
Zeacrinus (*barley-lily*), ... 181
elegans (*elegant*).
Zeuglodon (*yoke-tooth*), ... 44
cetoides (*whale-like*).
hydrarchus (*water-chief*).

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